**BINDURA UNIVERSITY OF SCIENCE EDUCATION**

**FACUILTY OF SCIENCE EDUCATION**

**DEPARTMENT OF SCIENCE AND MATHS EDUCATION**

**ASSESSMENT OF TEARCHERS’ PERCEPTIONS ON THE USE OF ICT IN TEACHING AND LEARNING OF BIOLOGY: A CASE OF SECONDARY SCHOOLS IN HURUNGWE DISTRICT MASHONALAND WESTPROVINCE**

**BY**

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# APPROVAL FORM

The undersigned certify that they have read, and recommended to the Bindura University of Science Education for acceptance a project entitled “*An assessment of teacher perceptions on the use of ICT in teaching and learning of Biology in secondary schools Hurungwe District Mashonaland West.”* Submitted by Denhere Tracy in partial fulfilment of Honor’s Bachelor of Science Education Degree

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# DEDICATION

This work is dedicated to God the Almighty my Saviour. Melisa, Sashah and Anopaishe, the most encouraging daughters a mom could ever know. Clever, the most supporting man a woman could wish to have. Tyrfine and Enia, your friendship was a gift, generously given, happily accepted and deeply appreciated.

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# ABSTRACT

The purpose of the study was to find out the perceptions of teachers on the integration or use of technology into teaching and learning of Biology in secondary schools of Hurungwe District Mashonaland West Province, Zimbabwe. The sample consisted of 12 biology teachers and 5 school heads in the district. Data was collected by the use of questionnaires and observations. From the study, the researcher found that, most schools have few computers; teachers had inadequate training on use of computer applications; most teachers did not use computer technology for personal growth and instructional purposes. In adequate number of computers in the sampled schools was a major challenge facing the integration of computer technology into the instruction process. Therefore, the study recommends increased accessibility of computers, adequate training on use of computer technology and development of a policy framework to guide on the path to effective computer integration into instruction process.

Keywords: *ICT, perceptions, Biology, Zimbabwe*

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# Chapter 1

1. **Introduction**

Use of information and technology (ICT) in education is one way through which learner achievement can be enhanced. In line with changes in the society, Chitate (2016) revealed that, the 21st century economy requires school graduates to be well conversant with modern electronic knowledge, embracing computer technology and other forms of media so as to remain competitive in the global employment market. As biology includes complex relationships of unfamiliar and abstract concepts, it is difficult to teach and learn (Green 2012). Learners often experience difficulty in understanding certain biological concepts and try to learn them through memorization without understanding (Kilic & Salam 2004). Teachers play a crucial role in the adoption and implementation of new technologies in education. Their perceptions are an important aspect that influences their adoption of ICT in teaching and learning (Zhou 2010).

Consortium (2017) postulated that, use of technology is of great importance in biology as computers can present the information visually through well prepared pictures, three dimensional model of pictures, animations, and interactive environments. As stated above by (Kilic & Salam 2004), we are living in the 21st century encompasses the information marked by rapid adoption of new technologies (Holland, 2015). The ICT influenced the way we live, communicate, socialize, learn or educate (Pelgum 2002). Introduction of ICT created a new global economy (Chitate 2016), that is powered by technology, fueled by information and driven by knowledge. It is widely accepted that access to ICT in education can help individuals to compete in a global economy by creating a skilled work force and facilitating social mobility (Wallet & Melgar, 2014).

Understanding this, the government of Zimbabwe through Ministry of Higher and Tertiary Education, Science and Technology (2016) aiming to turn the huge number of its potential young intelligent populace into a resourceful one, has emphasized on ICT in education by multi-media classrooms, teacher-led content development, e-learning module, and interactive digital text etc. So that teachers can collect subject based content from a single source, for which an official web portal called e-learning has been opened Mberi and Pambili (2016). With these, the aim of this study is study is to examine the perceptions of teachers on the use of technology as for teaching and learning of Biology.

## 1.1 Background of the study

Use of information and communication technology (ICT) according to Sang, Valcke, Braak, Tondeur and Zhu (2011) had been greatly recommended throughout the world and has rapidly took over the use of paper writing and books reading opting for the use of electronic gadgets, but there is little research especially in Zimbabwe secondary schools which shows if these electronic gadgets are there enough to be used and how they are being used (Teo, Chai, Hung & Lee 2008).

The ICT sector, according to Pelgum (2002) is developing fast in well-developed countries, like other developed countries, Bangladesh has adopted ICT tool for development, although Bangladesh got its main frame computer in 1963, mobile phones and personal computers only started to penetrate the market in large quantities in 1997 (Choy, Wong &Gao 2009). Operators like internet service providers (ISPs) were allowed to use very small aperture terminal satellite systems for overseas communication resulting in internet connectivity being opened in the country (Pilgrum 2002). In recent years the use of mobile phones, personal computers, laptops and scanners have witnessed tremendous growth (Mhlanga 2006).

Zimbabwe is one of the struggling countries in Africa in terms of using electronic gadgets. The number of those who access the internet cafes might be disturbed by the cost of computers (Mhlanga 2006). Chitate (2016) pointed, despite the fact that a growing population is computer literate, their awareness of the opportunity that the internet presents for them is limited.

Lack of ICT in rural areas is one of the main challenges in the development field in the education sector in rural schools (Tezci 2011a). Alike their counterparts in rural youth don’t have opportunity to gain computer skills. As a result urban learners are more likely to be up to standard with ICT than the generation of youth growing up in rural areas as revealed by Staples, Pugach and Himes (2005). While ICT continues to advance in the urban areas of Zimbabwe, rural schools still experience a lag in its implementation Parawira (2016). In a recent study by Ncube (2016), access to ICT facilities is a major challenge facing most Zimbabwean schools with a ratio of 1 computer to 150 students against the ratio of 1:15 students in urban areas.

ICT have changed the pedagogy in education offering more student-centered learning activities, Consortium (2017). The purpose of this study sought to examine the use of technology by the biology teachers in Hurungwe District Secondary Schools in Mashonaland West Province Zimbabwe. It has found that teachers have better access to computers and they have working knowledge on Microsoft Office Word, Excel, Power Point, and different web browsers. A good number of teachers used computers for preparing their lessons, use internet for accessing educational materials, takes classes with multi-media with the support of ICT, this also supported the research by Arubayi (2015). In addition, about 65 to 85 percent were found well trained and use ICT efficiently for effective teaching and learning of biology. According to Tezci (2011a) overall, the key issues and challenges found to be significant in using ICT by teachers were; -limited accessibility and network connection; -limited technical support, and-limited time and lack of teachers’ competency

Many teachers pointed that, they have less number of computers in the school to prepare for class work (Munda, 2013). They also noted problems emanating that hardware trouble shooting, software malfunction and unexpected power failure are challenges of using ICT. This paper unpacks strategies to provide and ensuring technical support to overcome software and hardware problems in the schools, purchasing of laptops by teachers and continuous in-service training on ICT.

## 1.2 Statement of the problem

Integration of ICT into teaching and learning is a complex process and one that may encounter a number of difficulties (Al-bataineh, Anderson & Toledo 2008). These difficulties are some of the key challenges that have been identified as barriers regarding teachers' use of ICT (Staples, Pugach and Himes 2005). The review of studies on the use of technology in education according to Supon and Ruffling (2009), has consistently found that students in technology rich environments experience positive effects in all subject area. Despite the many advantages associated with the use of ICTs and the numerous government efforts to investments and resources to integrate the use of technology in its operations Zhao and Cziko (2001), the rate at which ICT is used in classrooms is still far beyond expectations.

In addition, Chitate (2016) postulated that, the demand for ICT learning has been tremendous and the number of teachers who are trained to teach ICT cannot meet the demand. This failure to use ICT is itself a result of the prevailing digital knowledge divides and their causes are deeply imbedded in the learning and performance of Biology. Therefore, Harrison (2007) pointed that, there is need to energize action to bring technology into classroom for improved biology teaching, learning and performance. As such, the study sort to investigate integration of information and communication technology in the teaching and learning of Biology and the teacher perceptions in Hurungwe District Secondary Schools.

## 1.3 Purpose of the study

The purpose of the study was to examine perceptions of teachers on the use of ICT in teaching and learning of Biology. This study identifies challenges faced by teachers in using ICT in teaching and learning of Biology and provides solution to mitigate these challenges. The researcher argues that, effective use of ICT by teachers helps learners to successful pass Biology subject.

## 1.4 Objectives

1.4.1. To identify school teachers' perceptions in implementing ICT tools in teaching and learning in classroom.

1.4.2. To determine challenges of using ICT tools in teaching and learning in the classroom among school teachers.

* + 1. To identify ICT platforms teachers are using when teaching and learning.

## 1.5 Research questions

1.5.1. What are the school teachers' perceptions in implementing ICT tools in teaching and learning in classroom?

* + 1. What are the challenges faced by teachers when using ICT tools in teaching and learning in the classroom among school teachers?
    2. What are types of ICT platforms teachers are using in teaching and learning in the classroom?

## 1.6 Assumptions

1.6.1. Openness from teachers

1.6.2 Assuming that every information which is going to be gathered is true, correct and relevant

1.6.3 Risk of being given falsified information due to internal reasons

1.6.4 Getting unconditional cooperation of Biology teachers in the district.

## 1.7 Delimitations

The study will be based in Hurungwe Biology teachers and their perceptions on the use of ICT in teaching and learning of biology. The study was carried out in secondary schools that offer science subject at ordinary and advanced level. The communities of the school differ in terms of financial resources, infrastructure and student behavior. Some schools are in urban areas, some in peri-urban areas, and some in rural areas. Schools in urban have access to computers and good internet facilities compared to those in peri-urban and rural and remote areas. The research into the perceptions of teachers on integration of ICT in teaching biology was relatively new and hence little information on the subject was accessed. In addition, teachers and students who are indulged in the traditional method of teaching and learning biology are still need copying up for the new era of technology. Teachers require experience to handle ICT, implementing computers and the internet is expensive.

## 1.8 Limitations

The sample of 10 selected schools may not be a true representative of the situation representative of the situation obtained on the ground. The research was conducted under very limited time, so that some of the essential are not going to be covered. Due official secrecy act some officials might not want to divulge pertinent information required by the researcher. Some teachers may feel that the research disturbed the teaching and learning of the teachers and pupils may not willing to accommodate the research in their school. They may also fear that it is an examination of their character as a teacher and, thus, may fabricate some responses.

The researcher was working on fulltime basis therefore carrying out the research efficiently was a problem however the researcher had to work with the science HODs who assisted with the distribution and collection of questionnaires. The research was conducted under very limited time and finances so a written survey was done since it is fast and cheap to administer.

## 1.9 Definition of terms

**Information Communication Technology ICT**

ICT Information Communications Technology is defined by Chitate (2016) as the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form for examples computers and smartphones (Jones, 2018).

**Teaching**

Teaching can be defined as engagement with learners to enable their understanding and application of knowledge, concepts and processes (Supon & Ruffini 2009). It includes design, content selection, delivery, assessment and reflection. To teach is to engage students into learning; thus teaching consists of getting students involved in the active construction of knowledge. Good teaching requires commitment to a systematic understanding of learning (Mapiye, 2012). Therefore, teaching is fundamentally about creating the pedagogical, social, and ethical conditions under which students agree to take charge of their own learning, individually and collectively.

**Learning**

According to White, James and Yi-Fang (2005), learning can be defined as relatively permanent change in one’s knowledge or behavior because of the experience. This has revealed by Reid (2002), the definition has 3 components which are: the time of the change is long term not short term; the locus of the change is the content and structure of knowledge in memory or the behavior of the learner, and, the cause of the change is in the learner’s experience in the environment rather than the fatigue, motivation, drugs physical condition or physiological intervention. White, James and Yi-Fang (2005) added that learning can be defined as the acquisition of knowledge.

**Perception**

Perception has defined by Hutchison and Reinking (2011) as the way in which something is

regarded, understood or interpreted. Therefore, teacher’s perception has defined as thoughts or mental images which teachers have about their professional activities and their students, which are shaped by their background knowledge and life experiences and influence their professional behavior, or the perspective and point of view of teachers on a given topic using direct questions in a semi-structured interview and in focus group (Makosi, 2018).

**Biology**

Musante and Potter (2012) defined biology as a natural science which cooperates the study of life and living organisms including their physical and chemical structure, function, development and evaluation.

## 1.10 Conclusion

The chapter revealed that biology is a subject that can be taught in the classroom environment by the use of ICT, though teachers have their perceptions on the use of ICT. Chapter one did set objectives that will give directions in the carrying out of the study. It was also about the assumptions of the researcher on the study and also the importance of the study. This chapter was focusing on the scope of the study, hindrances of the study that is limitations. This was also taking into consideration the meanings of different words that the researcher will be using throughout the research. The next chapter will be highlighting what other sources are saying pertaining to the teacher perceptions on the use of ICT in the teaching and learning of biology.

## Chapter 2

## Review of related literature

## 2.1 Introduction

This chapter is about the related literature. It shows the related literature on use of ICT and teacher's perceptions in teaching and learning of biology. Information and technology ICT includes computers, the internet, and electronic delivery system such as radios, television, and projectors among others, and is widely used in today's education field Chitate (2016). Kent and Facer (2004) indicated that school is an important environment in which students participate in a wide range of computer activities.

ICT is being applied successfully in instruction, learning and assessment (Teo, Chai, Hung & Lee 2008). According to Chitate (2016), ICT is considered a powerful tool for educational change and reform. A number of previous studies review that an appropriate use of ICT can raise educational quality and connect learning to real-life situations (Lowther, et Al. 2008; Weert & Tattnall 2005). As Weert and Tattnall (2005) have pointed out, learning is an ongoing lifelong activity where learners change their expectations by seeking knowledge, which departs from traditional approach. As time goes by, they will have to expect and be willing to seek out new sources of knowledge. Skills using ICT will be an indispensable prerequisite for these learners.

ICT tends to expand access to education. Through ICT Pelgum (2002), learning can occur anytime and anywhere. Based on ICT, learning and teaching no longer depend exclusively on printed materials. Multiple resources, are abundant on the internet, and knowledge can be acquired through video clips, audio sounds, visual presentation and so on (Arubayi 2015). Current research has indicated that ICT assist in transforming a teaching environment into a learner- centered one (Castro Sanchez & Aleman 2011). Since are actively involved in the learning process in ICT classrooms, they are authorized by the teacher to make decisions, plans and so forth (Lu, Hou & Huang 2010). ICT therefore provides both learners and teachers with more educational affordances and possibilities. Most specific benefits of using ICT in education and barriers are described below.

## 2.2 Teaching methods in Biology

A method can simply be described as the way in which one does something (Arubayi 2015). The method a teacher uses to bring the desired outcome in the teaching and learning process cannot be overlooked (Arubayi 20150. All the methods of teaching science can be classified into two types which are teacher-centered and learner-centered. According to Harrison and Killion (2007), teacher centered methods focus on telling, memorizing, and recalling information. Pariwa (2016) pointed, student participation is limited wherein they only ask questions or answer questions. Most of the time learners are passive listeners and receive the knowledge. The teacher is center of the process that goes on in the classroom (Craswell 2009). Learner-centered, emphasizes on need, requirement, interest and capability of students. The student are active participants where in their skills and abilities are developed. The climate in the classroom is conducive where in flexibility in there. According to Harrison (2007), teacher and students jointly explore the different aspects of the problem. The function of the teacher is to create a problematic situation, provide materials and resources for the students which help to solve the problem. The teacher then assists in identifying issues, state hypotheses, clarify and test hypotheses and draw conclusions, (Harrison & Killion, 2007).

There are a various methods available for achieving effectiveness and the teacher has full responsibility for selecting the most appropriate method for the prevailing circumstances in order to achieve the aims of teaching science in secondary schools. According to Arubayi (2015), these methods are laboratory, practical work, demonstration, and project and guided discovery and inquiry methods.

Arubayi (2015) commented that in laboratory method, the laboratory is an indispensable tool in the teaching of science which provides students with a place or setting, to attack and solve problems, collect data, prove ideas and carry out investigations which emphasizes learning by “doing”. This laboratory method of teaching is made up of different types of activities ranging from the experimental investigations to confirmatory exercises and skill learning. Harrison and Killion (2007) postulated that the major objectives found in laboratory work are as follows, the development of skills, concepts, cognitive abilities and understanding of the nature of science. The skills such as manipulative, inquiry, investigation, organizational and communicative, can be developed from laboratory experiences. Genome (2012) added that concepts such as hypothesis, theoretical models and taxonomic category are developed and cognitive abilities such as critical thinking, problem solving, application, analysis, synthesis, evaluation, decision making, and creativity are developed through laboratory experiences.

Arubayi (2015) suggested that practical work is another teaching method in science. Genome (2012) supported that good quality practical work can engage students, help them to develop important skills, help them to understand the process of scientific investigation and develop the understanding of the concepts. Practical works are very important because can help the learner, clarify and extend the learner’s experience of natural phenomenon. It provides opportunities for students to practice the correct use of apparatus which is very important in teaching of biology.

Demonstration method according to Arubayi (2015), is another method of teaching science. He described this method of instruction as a showing procedure, to explain, to teach and inform students. Harrison and Killion (2007) added that demonstration method is a visible presentation of ideas, skills, attitudes, processes and other intangibles. Genome (2012) postulated that for a successful lesson and for it to be very effective during the demonstration method, the lesson should be planned ahead of time, have all necessary materials and equipment needed for the demonstration lesson and participants should be given clear and simple instructions.

Project method is another example of a method of teaching science in secondary schools. Uzoka (2002) pointed that project method is any activity that is done by learners mentally and physically but in real life situation under the guidance of a teacher. In other words, according to Green (2012), the great aim is to allow students to have first-hand experience on how to do something. According to Arubayi (2015), inquiry based approach, is another way used in learning of science. This approach has a potential to increase intellectual engagement and foster deep understanding through the development of hands-on, minds-on and research based disposition towards teaching and learning (Lu, Hou & Huang 2010).

## 2.3 Benefits of using ICT in education

The merits of using ICT in education have been extolled in the literature. The use of ICT has been found to:

2.3.1. Assist students in accessing digital information efficiently and effectively.

As Brush, Glazewski and Hew (2008) have stated, ICT is used as a tool for students to discover learning topics, solve problem, and provide solutions to the problems in the learning process. ICT makes knowledge acquisition more accessible, and concepts in learning areas are understood while engaging students in the application of ICT.

* + 1. Support student-centered and self-directed learning.

Students build new knowledge through accessing, selecting, organizing, and interpreting information and data. Based on learning through ICT, students are more capable of using information and data from various sources and critically assessing the quality of learning materials (Castro Sanchez & Alman 2011).

* + 1. Produce a creative learning environment

ICT develops student's new understanding in their areas of learning (Chai, Koh & Stain 2010). Learners can access all reading texts with ease through computers, laptops, personal/digital assistants (PDAs), or iPad. ICT involves purpose-designed applicants that provide innovative ways to meet a variety of learning needs.

1. Promote collaborative learning in a distance - learning environment.
2. Koc (2005) mentioned that using ICT enables students to communicate, share, and work collaboratively anywhere, anytime. For instance, a teleconference classroom, could invite students around the world to gather together simultaneously for a topic discussion. They may have the opportunity to analyze problems and explore ideas as well as to develop concepts. They may further evaluate ICT learning solutions. Students not only acquire knowledge together, but also share diverse learning experiences from one another in order to express themselves and reflect on their learning (Creswell 2009).
3. Offer more opportunities to develop critical thinking skills.
4. Based on a constructive learning approach, ICT helps students focus on higher level concepts rather than less meaningful tasks (Levin & Wadmany 2006). McMahon's study (2009) showed that there were statistically significant correlations between studying with ICT and acquisition of critical thinking skills. A longer exposure in the ICT environment can foster students' higher critical thinking skills. Thus schools are strongly advised to integrate technology across all of the learning areas and among all learning levels. Where this is done, students are able to apply technology to the attainment of higher levels of cognition within specific learning context.
5. Improve teaching and learning quality
6. As Lowther et Al. (2008) have stated that there are three important characteristics needed to develop good quality teaching and learning ICT: autonomy, capability and creativity. In this way, they become more capable of working by themselves and with others. Miller and Ribble (2010) posits, teachers can also authorize students to complete certain tasks with peers or in groups. Through collaborative learning with ICT, the students have more opportunity to build the new knowledge onto their background knowledge, and become more confident to take risks and learn from their mistakes (Green 2012). With regard to capability, once students are more confident in learning process, they can develop the capability to apply and transfer knowledge while using new technology with efficiency and effectiveness. By using ICT, students' creativity can be optimized. They may discover new multimedia tools and create materials in the styles readily available to them through games (Gee 2007, 2011), CDs and television. With a combination of students' autonomy, capability and creativity, the use of ICT can improve both teaching and learning quality.

## 2.4 Barriers and solutions: Student perspective

Although the advantages of using ICT in the classroom have been demonstrated in the previous, barrier or challenges associated with its use still exist. Frederick, Schweizer and Lowe (2006) showed that student mobility, special needs and ancient over standardized tests results are the main challenges associated with ICT use. These challenges can be solved by providing more authentic group and problem-based learning support (Whelan 2008). Whelan (2008) also identified more barriers from the student perspectives, including: subpar technical skills that reduce access to ICT in classroom; an insufficient number of academic advisor and lack of timely feedback from teachers, and reduced interaction with peers and educators.

Therefore, the author recommends the following strategies to facilitate the learning process more induction, orientation, and training for students: an increased emphasis the importance of instructor access and effective administration and the function of podcasting and online conferencing tools. In general, capacity building, curriculum development, infrastructure, policy and government and government support are required in order to lower the student barriers and improve the effectiveness of ICT use in the classroom. In addition, Castro Sanchez and Aleman (2011) encourage students to acquire specific technical skills to facilitate learning in ICT.

## 2.5 Barriers and solutions: Teacher perspective

Barrier to effective technology integration from a teacher perspective include:

1. Low teacher expectations and a lack of clear goals for ICT use in schools (Al-Bataineh et al. 2008);

2. A lack of teacher collaboration and pedagogical support, as well as a lack of experience among cooperating teachers (Ertmer & Otteenbreit-Leftwhich 2010);

3. Insufficient skills for managing teaching materials (Frederick, Schweitzer & Lowe 2006);

4. Low software competence and habitual ways of conceptualizing what and how students should learn (Goktas, Yidrim & Yildrim 2009);

5.Limited knowledge and experience of ICT in teaching context (Honan 2008);

6. A lack of specific knowledge about technology and how to combine it with the existing pedagogical content knowledge to support student learning (Hutchison &Reinking 2011);

7. Excessive focus on teaching technical or operational skills rather than course content (Lim 2007);

8. Pressure to increase scores on national examinations (Liu &Szabo 2009);

9. A lack of recognition and encouragement of the timely and effective use of ICT (Tezci 2011a);

10. A lack of in-service training on the use of ICT (Yidrim 2007);

11. Technical problems in the classroom (Yidrim 2007);

12. Class management with large class size (Tezci 2011a);

13. A lack of motivation, and technical and financial support (Liu &Szabo 2009).

Several strategies of dealing with these challenges have been suggested. Schools are encouraged to:

1. Provide professional development activities related to technology to update teacher's skills and knowledge, and offer technical support when needed (Al- Bataineh et Al. 2008).

2. Support partnership that helps teachers share effective technology practices and experiences (Ertmer & Otternbeit-Leftwich 2010);

Provide workshops that allow teachers to reflect upon effective strategies for technology integration into instruction and unveil issues that are central to understanding the process of technology integration into instruction (Almekhlafi & Almeqdadi 2010).

3.Offer opportunities to virtually observed teachers who use technology (Frederick, Schweizer & Lowe 2006);

4. Provide enough freedom for teachers in selecting and covering curriculum materials (Honan, 2008).

5. Provide enough freedom for teachers in selecting and covering curriculum materials (Honan 2008)

6.Provide effective, timely, and continuous training to improve ICT skills and manage a technology-rich classroom (Hutchison and Reinking 2011);

7. Encourage positive attitude about significance of integrating ICT into instruction (Lim 2007); and

8.Provide adequate technical support (Liu and Szabo 2009, Tezci 2011a and Yildrim 2007).

Technology should be used for more than just support of traditional teaching methods (Tezci 2011a). According to Tezci (2011a), teachers should learn not only how to use technology to enhance traditional teaching or increase productivity, but also should learn from a student-centered perspective how ICT can be integrated into classroom activities in order to promote student learning. This means that teachers need to use ICT in more creative and productive ways in order to create more engaging and rewarding activities and more effective lessons (Birch & Irvine 2009; Honan 2008). Hence, Castro Sanchez and Aleman (2011) suggested that teachers keep an open mind about ICT integration in classroom. It is imperative that teachers learn new teaching strategies to adapt to the new instruments when teaching with technology.

However, Yildirim (2007) found that teachers use ICT more frequently for the preparation of handouts and tests than to promote critical thinking. Similarly, Palak and Walls (2009) found that teachers mainly use technology to support their existing teaching approaches and rarely to student-centered learning.

According to the authors, one possible explanation is lack of models for how to use technology to facilitate learning, and limitations related to contextual factors such as class size and student ability. Further, Brush, Glazewski and Hew (2008) found that pre-service teacher preparation does not provide sufficient ICT knowledge to support technology-based instruction, nor does it successfully demonstrate appropriate methods for integrating technology within a curriculum. More training should be provided in pre-service teachers' curricula, and ICT skills must be applied in the classroom in order to integrate effective technology strategies (Supon & Ruffini 2009). To help teachers cope with these difficulties, Chen (2008) suggested that rather than only providing education theories, ICT researchers should also document examples of how teachers accomplish meaningful and effective technology integration to meet their pedagogical goals and needs.

## 2.6 Barriers and solutions: Administrative and ICT infrastructure perspectives

In addition to the challenges faced by both students and teachers in the use of ICT, other obstacles also exist in terms of an administrative and ICT infrastructures such barriers include:

a) School inspectors focus more on the quality of course content and student's test scores than on ICT usage (Yildirim 2007).

b) A lack of appropriate administrative support for the effective use of ICT (Lim 2007).

c)Administrative mandates to improve examination results which shift the focus away from using ICT to engage students in higher-order thinking activities (Goktas, Yildirim & Yildirim 2009);

d) A lack of appropriate course content and instructional programs (Yildirim 2007); and

e) A lack of appropriate hardware, software, and materials (Yildirim 2007).

To address these barriers, Yildirim suggested that schools need to provide access to technology. Furthermore, schools and related institutional systems need to employ new policies to involve teachers in the decision-making and planning processes regarding ICT in their classroom Ertmer and Otternbeit-Leftwich (2010) reviewed the existing literature on the necessary elements to enable pre-service and in-service teachers to apply ICT as a meaningful pedagogical tool. They recommended that schools provide teachers with solid evidence supporting the positive impact of technology - based and student-centered instruction on student learning and achievement on standardized tests.

For instance, schools can provide opportunities for pre-service teachers to observe a variety of examples and models, which they can apply with real learners. In sum, school leaders should ensure that teachers understand that the ultimate objective of technology integration is to advance the teaching and learning process, not replace it. Developing a pedagogical model requires a strong link between theory and application in order to help teachers overcome the obstacles faced in technology (Keengwe & Onchwari 2009). Thus, Staples, Pugach and Himes (2005) stated that good planning for technology integration requires a special understanding of specific hardware and software related to the curriculum. Staff development and teacher training are also indispensable to supporting the curriculum with technology integration.

## 2.7Factors influencing the use of ICT.

Factors influencing the use of ICT can be divided into external and internal factors. The two types of factors have related to each other and to ICT usage level (Tezci 2011a). A variety of external factors have been identified that influence the progression or effectiveness of technology integration in schools. These includes technology-availability, accessibility of ICT equipment on time to plan for instruction, technical and administrative support, school curriculum, school culture and climate, faculty teaching load and management routine, and pressure to prepare students for national examinations. Among these external factors, the most common are lack of access to computers and software, insufficient time for course planning, and inadequate technical and administrative support (Chen 2008).

Several internal factors also influence technology integration outcomes (Sang et al. 2011). Internal factors related to teachers include: understanding of ICT use; beliefs, which may conflict with the application of ICT attitudes toward technology integration, perceptions, including intention or motivation to use ICT; self-confidence and knowledge, technology skills, readiness to use ICT; and technology self-efficacy (Al-Ruz & Khasawneh 2011, Chen 2008, Lin, Wang and Lin 2012, Sang et Al. 2011, Tezci 2011a). Chen (2008) discovered two common issues associated with internal factors. First, teachers may implement policies based on limited or improper theoretical interpretations and comprehension of ICT use.

Second, teachers may be under pressure to cover all content on their own with technology due to their other conflicting beliefs. A school culture emphasizing competition and a high stakes assessment system can discourage teachers from integrating technology into their classrooms (Abbot & Faris 2000). Thus teacher beliefs influence ICT use in the classroom (Chen 2008). Even though technology can foster interactive, self-directed learning and higher order thinking, technology integration is not the most effective way to improve learning. Through a combination of constructivist learning and technology, learners will be assisted in an active learning process and encouraged to organize information by making internal cognitive connections. ICT, therefore, will not in itself prove effective in the classroom without teachers who possess knowledge of both the technology and how to use it to meet educational goals (Koc 2005).

## 2.8 Teacher attitudes, perceptions and confidence in ICT use.

As established in the literature, internal variables greatly influence how teachers integrate technology in the classroom. But which variable has the strongest impact on ICT use and how internal variables are influenced by ICT preparation programs are discussed below. Palak and Walls (2009) conducted a mixed study to investigate whether teachers who frequently integrate technology and work at technology-rich schools shift their beliefs and practices toward a student-centred paradigm. The results showed that their practices did not change; neither student-centred nor teacher-centred beliefs are powerful predictors of practices. However, teachers’ attitudes toward technology significantly predict teacher and student technology use, as well as the use of a variety of instructional strategies. Sang et al. (2010) focused on the impact of Chinese student teachers’ gender, constructivist teaching beliefs, teaching self-efficacy, computer self-efficacy, and computer attitudes on their prospective ICT use. The findings confirmed the results of the study by Palak and Walls (2009) that the strongest predictor of future ICT use were teachers’ attitudes toward it.

In addition to the influence of teacher attitudes, Sang et al. (2010) further indicated that pre-service teachers with highly constructivist teaching beliefs have stronger intentions to integrate technology into their future teaching practices. Furthermore, Ai-ruz and Khasawneh (2011) revealed, more confident pre-service teachers were more capable of and interested in using computers in real classrooms. Thus, although teachers’ attitudes towards ICT use were found to be the strongest predictor of technology integration, the impact of their beliefs and confidence in using ICT should not be disregarded either. Internal variables can partially explain the success of technology integration in the classroom (Keengwe & Onchwari 2009).

However, the influence of these variables may change after participation in technology preparation courses or programs. Abbott and Faris (2000) examined pre-service teachers ’attitudes toward the use of computers before and after a semester-long technology literacy course. The results showed that positive attitudes toward computers increased after the course because of the instructional approaches, meaningful assignments requiring technology, and supportive faculty. Thus, the authors claimed that teacher education programs should teach pre-service teachers not only how to use hardware and software, but also how to incorporate computers into their teaching strategies and activities (Tezci 2011a). The authors also noted that small group sand collaborative learning are the most appropriate when introducing new hardware and software because more advanced and experienced teachers can assist those who need more technology learning support.

Another similar study was conducted by Doering, Hughes and Huffman (2003), who analysed

Pre-service teachers’ perspectives regarding ICT in their future classrooms before and after

participation in a teacher preparation program. Prior to taking the preparation courses, teachers were doubtful about the utility of ICT in the classroom, implying that they would closely examine and consider technology integration, rather than blindly incorporate it into their teaching practices. After completing the courses, their doubt had transformed into more positive sentiments (Makope, 2020). The teachers had a better understanding about ICT use in the classroom. Although the teachers confronted other issues such as technology availability, accessibility, professional support, and classroom management, their perceptions about technology’s role had changed. They were more likely to believe that technology can assist in learning and to recognize its importance (Hutchison & Reinking 2011).

Serhan (2009) and Chai, Koh and Tsai (2010) also investigated pre-service teachers’ beliefs

about the use of computer technology and the effectiveness of ICT courses. The results of both

studies indicate that after participating in courses, pre-service teachers recognized the importance of technology integration into their curricula and believed that ICT use would enhance student learning. They felt that such courses prepared them to apply ICT in the future, and their abilities to select, evaluate, and use a variety of technological resources improved. More specifically, Chai, Koh and Tsai (2010) found that ICT courses with direct instruction on the use of technological tools through the technology enhanced lesson (TEL) approach helped teachers learn how to use technologies as supporting tools in order to enhance their teaching and student learning. Consequently, the pre-service teachers viewed the preparation course favourably. It is worth exploring how the ICT preparation courses or programs change teachers’ intentions and actions. Choy, Wong and Gao (2009) conducted a mixed study to examine the intentions of pre-service teachers before and after a technology preparation course. Their intentions were then compared with their actions related to technology integration during their teaching. Confirming previous results from Doering, Hughes and Huffman (2003), the findings showed that their intentions became significantly more positive, as a result of increased pedagogical knowledge. Nevertheless, these teachers were not able to translate the positive intentions into actual teaching, largely due to unfamiliar school environments. Based on these results, Choy, Wong and Gao (2009) concluded that teacher education programs need to increase awareness of the benefits of integrating technology into student-centred learning approaches, and provide pedagogical knowledge related to student-centred learning as well as technology integration strategies.

Beyond the impact of preparation courses on teacher perceptions and attitudes, Vannatta and Beyerbach (2000) reported increased proficiency in technology applications and instructional methods. They found a significant increase in technology integration for both pre-service and in-service teachers after participation in a preparation course. After the course, teachers were able to incorporate a constructivist view of technology integration into instruction in order to engage students in meaningful learning. Qualitatively, according to McMahon (2009), the pre-service teachers reported great benefits from the use of technology in the classroom after the course. The study concluded that simply teaching basic ICT skills is inadequate if teachers are to constructively integrate technology constructively into their instruction. More emphasis should be placed on advanced skills in teacher education programs in order to provide teachers with authentic opportunities to experience and develop lessons that integrate technology in a meaningful context. The findings also encourage collaborative learning in technology-related assignments.

## 2.9 Conclusion

This chapter revealed the related literature concerning the research. It focused on the use of ICT and teacher perception in teaching and learning of biology. It focused on the literature on the barriers which hinder the use of ICT in secondary schools. It also focused on teacher attitudes, perception and confidence in ICT use. The next chapter is on research methodology. It will present the research design, population, sampling procedure, research design, population, sampling procedure, research instrument, data collection, and presentation procedure.

# Chapter 3

# Research Methodology

## 3.1 Introduction

This chapter explains how the research was conducted. It focused on the research designs, target population, the sample and sampling procedures. It also be focusing on the research instruments. The research framework led methodologically to design a quantitative method according to research objectives to compile the whole picture. For accomplishing the study, a survey questionnaire was used to collect information from the teachers teaching biology in Secondary Schools Hurungwe District.

## 3.2 Research designs

Research design is the plan and structure of the investigation used to obtain evidence to answer research questions (Creswell 2012). The research is going to be a quantitative. Quantitative research as defined by Green (2012) is a paradigm which emphasizes on objective measurements and numerical analysis of data collected through questionnaires or survey. In a quantitative research, the goal is to determine relationship between one thing and another in a population. An advantage of quantitative research is that quantitative data is statistical driven and can provide a lot of information (Marion, 2005). The research can be conducted on a large scale and gives a lot of data, more information as far as value and statistics (Earl 2010). It is easy to compile data on to a chart or graph because of the numbers that are made available. However, quantitative research has a disadvantage in that it is costlier than using qualitative research.

The researcher used a survey. A survey is a data collection tool used to gather information about individual (Green 2012). Survey research is often used to assess thoughts, opinions and feelings. Survey research according to Creswell (2012) can be specific and limited or it might have more global widespread goals. There are different types of surveys research which include cross-sectional and longitudinal studies. In cross sectional studies, a sample or samples are drawn from the relevant population and studied once. A cross-sectional study describes characteristics of that population at one time but cannot give any insight as to the causes of population characteristics because it is a predictive correlation design (Craspon, 2009).

Longitudinal studies take measure of the same random sample at multiple time points. Unlike with a successive independent sample design, the design measures the difference in individual participant’s response overtime. Longitudinal studies are the easiest way to assess the effect of a natural occurring event. In this research, the researcher is going to use longitudinal studies (Creswell 2009).

## 3.3 Population

Population refers to any collection of specified group of human beings or of non-human entities such as objects, educational institutions, time units or geographical areas (Palak & Walls 2009). The population properly defined so that there is no ambiguity as to whether a given unit belongs to the population. For example, in a survey of achievement in mathematics, a researcher will have to define the population of students by age or by grade and, if necessary, he will also specify the type of school, the geographical area and the academic year for which the data will be collected (Moore et al 2009). The population targeted is 35 biology teachers and 297 secondary school learners. The study is a case of Hurungwe District Mashonaland West Province.

## 3.4 Sampling procedure

The researcher used a systematic random sampling. It is whereby the researcher randomly select a sample from the targeted population Weiss (2012). The population was divided into three categories which are urban schools, peri-urban schools and rural schools. A sample was selected from the urban and peri- urban schools because there were easy to travel from one place to another to administer questionnaires and observations. The sample comprised of 12 biology teachers, (seven male teachers and five female teachers) both from urban and peri-urban. A total of five school heads also interviewed this sum up to a total of 17 participants from the population 35 biology and science trained teachers, and school heads from 297secondaryschools in Hurungwe District. Kallen (2011), asserts that a relatively small sample is adequate and can allow estimate sampling error. The researcher chooses to work with a small group to ensure there is efficiency in the researcher’s research.

## 3.5 Research Instruments

These are the methods used in the data collection process as the researcher attempts to answer some of the questions in the investigations, Moore, McCabe and Craig (2009) propounds that instrumentation refers to the whole process through which data is collected and used to answer questions to the whole process through which data is collected and used to answer questions. In this research, the researcher used interviews and questionnaires.

**3.5.1 Interviews**

Weiss (2012) argues that an interview is unique research method that involves the collection of data through direct, verbal and face to face interaction between individuals. In this research, the researcher used open ended questions to the school heads. The questions consist of those demanding short and long answers. One advantage with interviews is that they allow face to face verbal communication. Campbell (2000) suggests that after the interviews school heads and teachers gain rapport or establish a friendly and secure relationship with the researcher. Certainties of confidential information may be obtained. Another advantage is that, the researcher gathers information on a non-verbal response like facial expressions and tone of the voice to get a deeper understanding of what the subject means. There is also high response rate and a lot of information (Creswell, 2012).

Interviews do have their own weaknesses. They are time consuming. Kallen (2011) revealed that interaction between the interviewee and interviewer can lead to undesirable results if questions asked are of a personal nature considerable hostility can occur. The researcher will try to overcome these weaknesses by asking short questions in effort to avoid long conversations preventing time consuming Lakumo (2013). The researcher made sure not to ask questions which are too personal in nature to avoid arguments and quarrels.

**3.5.2 Observations**

This basically was done during the data collection. It was employed to identify the real situation of the ground by the researcher. Brace (2004) define observation as a scientific tool which serves a formulated research purpose, recording systematically and is related to general propositions rather than being a repeat of interesting issues. When planned systematically, observations control reliability and validity (Creswell, 2012). The researcher just simply observes and takes down notes hence recording actions as they occur. The main advantage of observations is that information is ready and correct on the time of observation

**3.5.3. Questionnaires**

Weiss (2012) states that a questionnaire is a document which contains questionnaires that may be set down in a variety of formalities which are closed, open, forced choice and for her/himself. The researcher used self-developed cross-sectional survey questionnaire consists of three sections which was tested among participants. The questionnaire was based on three point ranging scale which are;

1. Ongoing support on the use of ICT

SD= strongly disagreed, N= neutral, SA = strongly agreed

2. Perception of teachers on use of ICT in teaching and learning of biology

GD = generally disagreed, N = neutral, GA = generally agreed

3. Use of ICT in teaching and learning of biology

GD = generally disagreed, N = Neutral, GA = generally agreed.

Campbell (2000) says that large amount of information can be collected from a large number of people in a short period of time. Questionnaire can be used for shy participants who cannot give response when interviewed. In questionnaire data is also collected in standardized format. McClave and Sincich (2009) said that questionnaires lack validity and also the participant may be forgetful or not thinking within the full context of the situation. To avoid these weaknesses, the researcher will make sure that the questions will be as clear as possible and can be easily understood and with simple English. Before issuing out the questionnaires the researcher will advise the subject to make the answers as short as possible and straight to the point.

## 3.6 Data collection procedure

For the data collection research consent was first sought and the data was collected from the twelve schools, the procedures are discussed below.

Triola (2012) defined population as any group of individuals that are composed of one or more characters in common and of interest to the researcher. Therefore, a population in research is the targeted group from which one intends to solicit information notably such as attitudes, values perceptions or feelings (Triola 2012). In this research, the researcher was interested in the teacher perceptions on the use of ICT in teaching and learning of biology. The main purpose is to investigate teacher perceptions on the use of ICT in secondary schools in Hurungwe District. It is anticipated that the selected population is gender balance as it comprised of both male and females. According to Campbell (2000), a sample is smaller but believed to be the representative collection of units from a population used to determine truth about that population. Data is gathered on a small part of the whole parent population or sampling frame and is used to inform what the whole picture is like. Sampling was done due to insufficient time, resources, finance and energy as well access to conduct research. For the purpose of this study, the sample consists of twelve secondary schools in the district offering biology subject. Biology teachers including HODs and school heads from selected schools took part in the research.

In this research the researcher used purposive sampling. According to Campbell (2000), in purposive sampling the researcher chooses the sample based on who they think would be appropriate for the study. Purposive sampling ensures balance of group size when multiple groups are to be selected and keeps the cost of conducting a research relatively low Campbell (2000). The researcher handpicked the participants on the basis on specific characteristics that of being science HODS, biology teachers and heads of schools under the survey.

Weiss (2012), postulated that purposive sampling increase the usefulness of information about phenomenon of interest. The researcher chose twelve schools out of a total of ninety-seven secondary schools in the district. Biology teachers was selected from urban schools and those in peri-urban. Sufficient questionnaires were distributed. Each teacher had to receive a questionnaire. Since the researcher wanted to carry out some interviews from the school heads, it was cost saving to hand in questionnaires in person. This also reduced the chances of losing some of the questionnaires as the researcher was assured that the questionnaires were left in the hands of the rightful participants. The researcher first made an appointment with the school heads and HODs in times and dates to administer the research. The teacher had to complete the questionnaire on their own spare time. The heads agreed to monitor these questionnaires and mail them back to the researcher after completion.

## 3.7 Ethical consideration

Craspom (2015) argues that when conducting a research, it is crucial that the researcher should adhere to ethics which include respect for rights of the participants as well as honesty. Research consent was sought from Bindura University of Science Education. Thereafter, permission was sought from the Provincial Director Mashonaland West Province, Hurungwe District. Schools Inspector (DSI), and from school heads were research was to be carried out.

The researcher respected people’s values. All people participated in questionnaires and interviews voluntarily (Dube, 2017). They were assured of confidentiality and privacy. They could join or quit the participation voluntarily without any repercussions. They were assured of risk-freedom and that, the purpose of the study was educational.

## 3.8 Conclusion

The chapter focused on the descriptive survey method which the researcher adapted in collecting data. A cross sectional was carried out. Questionnaires and interviews were the tools chosen to be used for collecting the data. The data for the study was analyzed on SPSS 10.4. Descriptive statistics was used to analyze the data. This chapter helped in gathering data relevant to the research study. In the next chapter the data collected is to presented and analyzed.

# Chapter 4

# Data Presentation, Interpretation and Analysis

## 4.1 Introduction

The study sought to establish if there was ongoing support of teachers to enable and motivate them utilize ICT in their teaching and learning of Biology in schools in Hurungwe District. Data analysis and presentation. The first step was that of transcription, that was getting the material from questionnaires, interviews and observation. Data was codified according to similar responses. Questions were coded as variables in SPSS (Statistical Packages for the Social Sciences) version 10.4. Tables were used to summarize and present collected data. The data was fully analyzed by means of descriptive statistics.

The findings were as shown Table 1.

**Table 1: On-going support**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | *SD* | *N* | *SA* |
| Government provides quality, relevant and affordable educational and training programs for Biology teaching. | Frequency  Percent | 6  35.3 | 3  17.6 | 8  47.1 |
| Schools develop and assess Human ICT Resources through National Examination for Biology integration in all levels of learning | Frequency  percent | 9  53 | 4  23.5 | 4  23.5 |
| Government recruit qualified Biology ICT teachers | Frequency  Percent | 2  11.8 | 5  29.4 | 10  59 |
| Government design and develop ICT curriculum for Biology for all levels of education and training | Frequency  Percent | 5  29.4 | 2  11.8 | 10  59 |
| Schools develop learning ICT resources for Biology | Frequency  Percent | 6  35.3 | 3  17.6 | 8  47.1 |

*SD=Strongly, Disagreed (SD+D) N= Neutral, Strongly Agreed (SA+A)*.

As shown in Table 1, it is evident that the ongoing support for ICT integration in teaching and learning Biology makes it possible for teachers to upgrade their knowledge and skills. From the findings, 8(47.1%) of the participants strongly agreed that government of Zimbabwe through the ministry of primary and secondary education provides quality, relevant and affordable educational and training for biology teaching, that was supported by the Ministry of Higher and Tertiary education, Science and Technology (2016). Some 6(35.3%), of the participants strongly disagree that the ministry of education develops and assesses Human ICT resources through the National Examination for Biology integration in all levels of learning as revealed by Honan (2008). Fifty-nine (59%) employed Biology teachers revealed that government develops ICT curriculum for biology for all level of education and training Arubayi (2015) whereas 5(29.4%) strongly disagree about the matter and 8(47.1%) said there is development of learning ICT learning resources for Biology, for instance, book manuals and trainers in new curriculum trends in education and training, and this was also supported by Ncube (2016). Research has identified that there is low support for the ICT integration due to lack of government assistance. The findings also revealed that, Hutchison and Reinking (2011), there is lack of adequate ICT tools in schools that cater for both the learner and the teacher. Many schools in the district do not have computer labs, overhead projectors hence the government employed biology teachers and develop ICT curriculum for biology for all levels of education and training through Ministry of Higher and Tertiary Education, Science and Technology (2016). These limited resources do not support effective learning.

## 4.2 Perception of ICT use in schools

Information and communication technology is of great importance to both learners and teachers. Both students and teachers are able to develop learning skills such as thinking and problem solving skills (Chitate 2016). The research therefore, sought to establish the perception of teachers on the use of ICT. The findings were shown in Table 2.

**Table 2: Perception of ICT use in schools**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Perceptions statements* |  | *GD* | *N* | *GA* |
| I use computers but not as much as other resources (books, overhead projectors) for instructional purposes | Frequency  Percent | 10  59 | 2  11.8 | 5  29.4 |
| I know what to do when using computers in instructional environments | Frequency  Percent | 2  11.8 | 1  5.9 | 14  82.4 |
| I am aware of the opportunity/important that computers offer | Frequency  Percent | 0  0 | 2  11.8 | 15  88.2 |
| I think that I can use ICT in class activities more effectively day by day | Frequency  Percent | 10  58.8 | 3  17.6 | 4  23.5 |
| I believe that tools like E-mail will make communication with my colleagues and students easier | Frequency  Percent | 0  0 | 2  11.8 | 15  88.2 |
| I think that ICT supported teaching makes learning more effective | Frequency  Percent | 0  0 | 1  5.9 | 16  94.1 |
| I think the use of ICT increases the quality of courses and productivity of teacher | Frequency  Percent | 3  17.6 | 7  41.2 | 5  29.4 |
| I think that usage of ICT makes it easier to prepare course material | Frequency  Percent | 0  0 | 1  5.9 | 16  94.1 |
| It is hard for me to explain the use of computer application to my students | Frequency  Percent | 0  0 | 5  29.4 | 12  70.6 |
| I think ICT makes effective us of class time | Frequency  Percent | 0  0 | 4  23.5 | 11  64.7 |
|  | *Mean* | *16.2* | *11.77* | *66.5* |

*GD= Generally Disagreed, N=Neutral, GA=Generally Agreed*

The study findings revealed that 5(29.4%) of the participants used computers but not as much as other resources (books, overhead projectors) for instructional purposes, this was in line with the works of Chitate (2016). The percentage number revealed that only teachers in urban and a few in peri-urban only had access to computers and good network connectivity this was in line with the support of woods (Chalima, 2009). In addition, power cut off and software troubleshooting will result in teachers end up using other source of material for example books and practical activities (Chitate 2016). Moreover, 14(82.4%) of the teachers knew what to do when using computers in instructional environments. This figure supported the statement from Chitate (2016) that, the government had trained enough ICT Biology teachers, about 82.4% of the sample representing the targeted population agreed that are aware on how to use ICT in teaching and learning (Arubayi 2015). In addition, 15(88.2%) of the teachers were aware of the opportunity that computers offer. According to Chitate (2016), revealed that ICT learning create a conducive learning environment, learners master concept through hands-on approach, student centered learning there by promoting critical thinking and problem solving in every learning situation (Arubayi 2015). Four (23.5%) of teachers thought that they could use instructional technologies in class activities more effectively day by day. The percentage number postulated that only few teachers believed in the integration and use of ICT in teaching and learning of biology, this was because of the 76.5% who strongly disagree with the matter. According to Honan (2008), the findings revealed that most rural school teachers could not afford to buy a computer and also the school administration also cannot afford due to levies that are paid by the learners that might not reach the expected demand (Chitate 2016). Furthermore, 15(82.2%) teachers also believed that tools like email will make communication with colleagues and students easier.

Positive attitudes towards the use of information and communication technology in teaching Biology may make teachers more interested in adopting the new technology, Chai et al (2010), learning more about new technology and be more willing to cope with the challenges of the new technology (Mberi & Pambili 2016). The study findings showed that 16(94.1%) of the teachers thought that technology-supported teaching makes learning more effective (Chitate 2016). In addition, 5(29%) of the teachers thought that the use of instructional technologies increases the quality of course and productivity of teachers

In addition, 16(94.1%) of teachers thought that the usage of instructional technologies makes it easier to prepare course materials, for instance, assignments and handouts, the supported by Ncube (2016). However, it is hard for teachers to explain the use of computer application to students as shown by 12(71.6%) of the participants (Honan 2008). Teachers pointed that, due to lack of access to computers in most schools in the district, it is difficult for them explain the use of computer application to student. This was supported by Tezci (2011a), in his words emphasizing on the effectiveness of practical based lesson over theoretical. Learners quickly grasped concepts through observations. In conclusion, teachers thought that technology makes effective use of class time as revealed by 11(64.7%), Hutchison and Reinking (2011), there was no participant who generally disagreed about the opinion and 6(34.3%) they were neutral about the issue. The teachers’ positive attitudes and perception of integration of ICT products is bound to their increased knowledge and skills in teaching and learning of Biology (Chitate 2016). Moreover, the mean average for those strongly disagreed (mean=16.2), neutral (mean= 11.7) and for those strongly agreed (mean= 66.5).

## 4.3 Use of ICT and Ability in Teaching Biology.

The research sought to establish the teaching capabilities of the participants. The findings are illustrated in Table 3.

**Table3: Use of ICT in Teaching Biology**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | *GD* | *N* | *GA* |
| I am able to teach Biology effectively using materials from the internet | Frequency  Percent | 0  0 | 2  11.7 | 15  88.2 |
| I can cover Biology syllabus within the time given with help of the computers integrated system | Frequency  Percent | 1  5.9 | 3  17.6 | 13  76.5 |
| I am able to organize teaching resources in order using computer organizer | Frequency  Percent | 0  0 | 3  17.6 | 14  82.4 |
| I am able to plan Biology lessons effectively using Excel timetables and reminders from the mobile phone | Frequency  Percent | 3  17.6 | 1  5.9 | 13  76.5 |
| I am able to effectively evaluate Biology performance of students through Microsoft excel | Frequency  Percent | 1  5.9 | 0  0 | 16  84.1 |
|  | *Mean* | *5.88* | *10.56* | *81.5* |

*GD*=*Generally Disagreed, N= Neutral, GA= Generally Agreed*

The findings in table 3 showed that when ICT products are used in teaching and learning of Biology, participants are able to teach more effectively (82.2%), the percentage of the participants able to use ICT clearly supported by the works of Ncube (2016). Teachers showed that they have trained enough to cover the Biology syllabus within the given time with a percentage of (76.5%) (Chitate 2016). In addition, teachers are able to plan Biology lessons effectively using ICT (76.5%) and organize teaching resources in order (82.4%). Lastly, teachers are better able to effectively to evaluate Biology performance of students (84.1%) when they use ICT resources in teaching and learning of Biology, supported by Abbot and Faris (2008). The findings reveal the mean average for those generally disagreed (mean=5.88), those neutral (mean=10.56) and finally, those generally agreed (mean 81.5).

## 4.4 Conclusion

In this chapter, the researcher interpreted and analyzed the gathered data. To make the presentation clear tables were used to summarize the information collected. The findings showed positive perceptions on teachers on the use of ICT in teaching and learning of Biology in secondary schools of Hurungwe District Mashonaland West Province. The findings showed that more than fifty percent of the teachers support the ongoing use of ICT, and teachers’ perception on the use of ICT in teaching and learning of Biology as ICT promote effective learning, and also the use of ICT enables teachers to plan Biology effectively. In the next chapter, the researcher will present the summary, conclusion and recommendations.

# Chapter 5

# Summary, Conclusion and Recommendations

## 5.1 Introduction

This chapter gives a summary of the entire research from the first chapter to the final chapter. It presents the conclusion reached on the topic after data collection, analysis and interpretation. Lastly, a list of some recommendations deemed relevant to the research problem are made.

## 5.2 Summary

From the study findings, it is evident that positive attitude toward technology enables teachers to adapt to new technologies, embrace the different charges in technology and also deal more aptly with emerging challenges (Hutchison &Reinking 2011). The findings revealed that teachers think that technology-supported teaching makes learning more effective. The findings therefore concur with the views of Drent and Meelissen in their study of the factors that influence the innovative use of ICT by teacher educators in Netherland. They posit that positive attitude towards computers and computer experience has a direct positive influence on the innovative use of ICT use of ICT by teachers.

The research findings on the usage of ICT are also in agreement with what Huang and Lu (2010) say, the teachers’ attitudes towards technology influences their acceptance of the usefulness of technology and its integration into teaching. Teachers also think that the use of instructional technologies increase the quality of courses and productivity of teacher. This is in agreement with the observations of EU Schoolet survey on teachers’ use of Acer net books were it was revealed that large number of participants believed that the use of net book had positive impact on their learning and lengthened study beyond school day. On the contrary, one fifth of the teachers believed that the use of ICT in teaching did not benefit their students’ learning and not all teachers are convinced that ICT should be an integral part of their teaching strategies as a result of resisting change to effective ICT integration.

## 5.3 Conclusion and Recommendations

From the study results, it is clear that teachers’ perception has a momentous effect on the teaching and learning of Biology. The findings show that positive attitude of teachers towards technology makes them more interested in adopting new technology and innovative use of ICT by the teachers which improves the learning process of students. Finally, teachers’ perception has a significant effect on the teaching and learning of Biology as evidenced from the study. Therefore, school administrations should encourage teachers to use technology, e.g. computers as much as other resources such as books and make teachers aware of the opportunities and importance that technology offers. There should also be workshops organized by school to stress on the importance of adapting to changes in technology.

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## APPENDICES

Appendix 1

SECTION A

Research questionnaires for teachers.

I am a student at Bindura University of Science Education carrying out a project on teacher’s perception on the use of ICT in teaching and learning of Biology. Kindly ask you to provide me with information on the following questions. The information you would provide will only be used for academic purpose and will remain confidential. Tick in appropriate box. For privacy do not write your name be honest with your answers.

Section A. Ongoing support on the integration of ICT in schools

(a) Government provides quality, relevant and affordable educational and training programs for biology teaching

Strongly Disagreed (SD) Neutral (N) Strongly Agreed (SA)

(b) School develop and assess Human ICT Resources through National Examination for Biology integration in all levels of learning

Strongly Disagreed (SD) Neutral (N) Strongly Agreed (SA)

(c) Government recruit qualified Biology ICT teachers

Strongly Disagreed (SD) Neutral (N) Strongly Agreed (SA)

(d) Government design and develop ICT curriculum for Biology for all levels of education and training

Strongly Disagreed (SD) Neutral (N) Strongly Agreed (SA)

(e) Schools develop learning ICT resources for Biology e.g. books, multi-media resources, conducting in-service training of teachers and trainers in new curriculum trends in education and training

Strongly Disagreed (SD) Neutral (N) Strongly Agreed (SA)

SECTION B

Perception of ICT use in schools

1. I use computers but not as much as other resources (books, overhead projectors) for instructional purposes

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

2. I know what to do when using computers in instructional environments

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

3. I am aware of the opportunity/important that computers offer

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

4. I think that tools like E-mail will make communication with my colleagues and students easier

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

5. I think that I can use ICT in class activities more effectively day by day

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

6. I think that ICT supported teaching makes learning more effective

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

7. I think the use of ICT quality of courses and productivity of teacher

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

8. I think that usage of ICT makes it easier to prepare course material

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

9. It is hard for me to explain the use of computer application to my learners

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

10. I think ICT makes effective use of class time

Generally Disagreed (GD) Neutral (N) Generally Agreed (GA)

## 

## APPENDIX II

PART 1

Interviews for teachers

a) Do you have any kind of electronic gadgets?

b) If yes what do you use your electronic for?

c) Do you own a computer?

e) How do you prepare lessons content?

f) Is it included on your school curriculum?

g) Are the computers enough for pupils?

PART 2

Interviews for the administration

a) Do you allow personal electronic gadgets for the pupils in the school?

b) If no why do avoid personal electronic gadgets for the pupils in the school?

c) Did you include it in your school curriculum?

d) If yes what benefits do you think ICT has on pupils?

e) On what ratio do the pupils share the computers?

f) Are the computers enough for the pupils?