APPROVAL FORM

The undersigned certify that they have supervised, read and recommends to the Bindura University of Science Education for acceptance a research project entitled:

Assessing the impact of e-tivities in the teaching of Mathematics Advanced Level.

Submitted By NYERUKAYI BENARD.

In partial fulfilment of the requirements for the POST GRADUATE DIPLOMA IN EDUCATION

(Signature of Student) Date

............................................../............./............./

(Signature of Supervisor) Date

............................................../............./............./

(Signature of the Chairperson) Date

............................................../............./............./
RELEASE FORM
NAME OF STUDENT : NYERUKAYI BENARD

PROJECT TITLE : Assessing the impact of e-tivities in the teaching of Mathematics Advanced Level.

DIPLOMA TITLE : POST GRADUATE DIPLOMA in Science Education (MATHEMATICS)

YEAR : This diploma was granted in November 2017

Permission is hereby granted to the Bindura University Library to produce single copies of this dissertation and to lend or sell such copies for private, scholarly or scientific research purposes. Only the author reserves other publication rights and, neither the dissertation nor extracts from it may be printed or otherwise be reproduced without the author’s written permission.

SIGNED ............................................

PERMANENT ADDRESS

2807 Lenana Park , Tynwald
Harare

DATE NOVEMBER 2017
DEDICATIONS

To my family members, the utmost influence on my life and pillars of my strength.
ABSTRACT

The use of E-tivities in the learning of Mathematics is a contemporary and topical debate in Zimbabwe. It was on this background that the research decided to undertake a study on the assessment of the use of E-trinities in the learning of Advanced level Mathematics at Kuwadzana 1 High. The views of different authorities on the use of E-tivities in the learning of Mathematics were reviewed. The study triangulated different data collection methods such as key informant interviews, documentary search, in-depth interviews, and observation and use of tests to obtain detailed data on the use of E-trinities in the learning of Mathematics at Kuwadzana 1 High. The findings of the study revealed that the use of E-tivities in the learning of Mathematics is mandatory and has to be included from primary level for better learning process. Teacher centred methodologies made the pupils to be passive learner which even affected their concentration span during lessons delivery. Adequate resources like interactive boards, Google groups also were another contributing factor that can be accredited to the betterment of the learning process of Mathematics.
ACKNOWLEDGEMENTS

I would like to acknowledge the support and help I received from various individuals during the course of this study.

Firstly, I am greatly indebted to my research supervisor, Mr. Ndemo for his guidance, encouragement and constructive criticism throughout this study. In spite of his busy schedule, he tried his best to give advice whenever possible.

I would like to thank my family members, who helped me financially and morally. Special thanks go to my mentor Mr. P. Manyonga, and the pupils at Kuwadzana 1 High School who contributed to the success of this study.

My sincere gratitude goes to my colleagues Nzombe 1, Hwangwa Brighton, Katena Casandra, and Makanda Edington for their invaluable support and assistance.

The support from the Almighty is always greatly appreciated.
Table of Contents

APPROVAL FORM ........................................................................................................ i
RELEASE FORM ........................................................................................................ ii
DEDICATIONS ........................................................................................................ iii
ABSTRACT ........................................................................................................ iv
ACKNOWLEDGEMENTS ................................................................................................ v
List Of Tables ........................................................................................................ ix
List Of Figures .......................................................................................................... x

CHAPTER ONE ........................................................................................................ 11
Introduction

1.1 Introduction ........................................................................................................ 11
1.2 Background of the study ................................................................................ 11
1.3 Statement of the problem ............................................................................. 12
1.4 Objectives of the study ................................................................................ 12
1.5 Research questions ..................................................................................... 12
1.6 Significance of the study ............................................................................ 13
1.6.1 Learners ................................................................................................ 13
1.6.2 Educators .............................................................................................. 13
1.6.3 Student teachers .................................................................................. 13
1.6.4 Curriculum Development Unit (C.D.U) ............................................ 13
1.6.5 Ministry of Primary and Secondary education ................................... 14
1.7 Limitations of the study ............................................................................. 14
1.8 Delimitations ............................................................................................... 14

CHAPTER TWO ....................................................................................................... 15
Literature Review ........................................................................................................ 15

2.1 Introduction .................................................................................................... 15
2.2 E-tivities in education ................................................................................ 16
List of Tables

Table 1-E-tivity tools ...................................................................................................45
Table 2. Response on E-tivity ......................................................................................47
Table 3. E-tivities resources .........................................................................................51
Table 4- Results on the lecture method ........................................................................53
Table 5. Pupil centered method....................................................................................54
List of Figures

Figure 1. Types of numbers .......................................................................................... 22
Figure 2. E-tivity tools ............................................................................................... 45
Figure 3. E-tivity media ............................................................................................. 46
Figure 4. Response on E-tivities .............................................................................. 47
Figure 5. E-tivities resources ................................................................................... 48
Figure 6. Teaching Media ......................................................................................... 49
Figure 7. E-tivities resources ................................................................................... 51
Figure 8. Lecture method ......................................................................................... 54
Figure 9. Pupil Centred Method .............................................................................. 55
CHAPTER ONE

1.1 Introduction
E-tivities has become an increasingly important teaching and learning mode of mathematics in educational institutions. The aim of this research project will be to assess the impact of e-tivities in the teaching of mathematics Advanced level at Kuwadzana 1 High School in Harare. In this Chapter, the researcher analyzed the general background, statement of the problem, assumptions, and research objectives, justification of study, delimitations and limitations of the study.

1.2 Background of the study

Mathematics is a group of related sciences concerned with the study of numbers, quantities, shape and space and its operations and processes need a lot of concentration and a clear method of demonstration. During my teaching practice, I am going to assess with great concern the impact of e-tivities in the teaching of Advanced level Mathematics. The researcher also assessed the notion that generally pupils at Advanced level had very little interest in mastering mathematical concepts using e-tivities. E-tivities presence an entirely new learning environment for students, thus requiring a different skill set to be successful (Romiszowski, 2004). Critical thinking, research, and evaluation skills are growing in importance as students have increasing volumes of information from a variety of sources to sort through (New Media Consortium, 2007). Also, particularly in mathematics which is electronic, students are much more independent than in the traditional setting. This requires that they be highly motivated and committed to learning (Huynh et al., 2003), with less social interaction with peers or an instructor. Students in online courses tend to do as well as those in classrooms, but there is higher incidence of withdrawal or incomplete grades (Zhang, Zhou and Briggs, 2006). The learning of Mathematics seems not to be interesting, so the purpose of this research was to find means and ways to make the subject interesting to learners.
1.3 **Statement of the problem**

Learners at Advanced level seem to have problems in understanding mathematical concepts. The interest of the subject at Advanced level is perceived to be low by the researcher. The level of motivation and concentration of students during Advanced level lesson raised the question which led the researcher raise eyebrows and to carry out a research to assess the impact of E-tivities in the teaching of Mathematics. The perceived notions emanated from their previous experience with different mathematics teachers who either mystified the subject or employed methods which were less interesting making the pupils dislike the subject or fail to master concepts in mathematics. E-tivities has become popular because of its potential for providing more flexible access to content and instruction at any time, from any place Miller and Higgins (2000). The research therefore, seeks to assess the impact of the use of E-tivities in the teaching of Advanced level Mathematics at Kuwadzana 1 High.

1.4 **Objectives of the study**

The study seeks to:

(i) Evaluate the impact of e-tivity tools on the teaching of Advanced level Mathematics.

(ii) Find out the effects of e-tivity tools on learners’ participation during Mathematics lessons.

(iii) Find out the usefulness of common e-tivity tools used in the teaching of Mathematics.

1.5 **Research questions**

The study will be guided by the following questions

1. What is the impact of using e-tivity tools during instruction?

2. What will be the challenges associated with the use of e-tivity tools in the teaching of mathematics.
3. What will be the usefulness of common e-tivities tools used in the teaching of Mathematics?

1.6 Significance of the study

The study will benefit the following stakeholders:

1.6.1 Learners

When the study is complete, learners will benefit from the study as they will be able to read the suggestions and recommendations raised in the study.

1.6.2 Educators

Educators will benefit after reading this research project as the recommendations and advice given on the use of e-tivity tools in the teaching of mathematics will go a long way to assist them. After reading the project teachers will be able to use methods as they will be recommended in the teaching of mathematics and slowly move away from the chalk and talk method. The research will also assist teachers to be able to teach well the topics which appear abstract as the e-tivity tools will help them clear the misty areas and will make the pupils to understand concepts much better.

1.6.3 Student teachers

Student teachers benefit in the sense that, they will employ effective teaching methodologies that enhance learning. In particular equip pupils with basic skills of operating e-tivity tools. In other words the student teachers are core beneficiaries of e-tivity in such a way that they acquire detailed information pertaining a particular topic and research on possible way that enhance knowledge acquisition. Lim-Teo (2002)

1.6.4 Curriculum Development Unit (C.D.U)

The curriculum design unit will also benefit from the study as they will adhere to the suggestions given in the study on how to use e-tivity tools during instruction. Also they will be aware of the key challenges involved in the use of e-tivity tools when teaching mathematics at primary school level. Since the CDU is also charged with the responsibility of designing and making teaching
materials for each curriculum area, the study will go a long way to assist them with the contemporary tools to use when teaching mathematics.

1.6.5 Ministry of Primary and Secondary education
The ministry of Primary and Secondary education would benefit from the study in the following ways. It will devise a clear guide line of teaching methodologies that are of great importance in the teaching of pupils and students at all levels. In other words the ministry would craft a teaching framework for college students and those in the line of higher and tertiary education.

1.7 Limitations of the study
During the study the researcher faced a number of huddles. Some of the challenges included failure to get adequate time to do the study since the school in which the study was being done was a day school with a double session. This was resolved by requesting time from the head to collect data during the extra times when pupils will be free. The teacher also had to work at night when pupils will be having individual studies as well. Leaving pupils once a fortnight will not an easy thing as the school would require the student to be always at school attending to school business.

1.8 Delimitations
The study was carried out at Kuwadzana 1 High Secondary school which is a day school and also draws its clientele base from the Warren Park Malbereign district. The school is situated around 15 Kilometres to the west of the Harare central business district and have a stuff compliment of one hundred and five(105) qualified teachers some student teachers. In addition to that, the school have an enrolment of 2500 pupils and also have a track record of producing good Advanced level results.
CHAPTER TWO

Literature Review

2.1 Introduction
The chapter consists of definition of main terms and also literature of what has been researched on the issue of e-tivities.

2.2 What are e-tivities?
E-tivities is an umbrella term that involves the use of electronic gadgets or any communication device or application in the learning process. YouTube, google groups, WhatsApp groups, satellite systems, Interactive boards, outcome tables, as well as the various services and applications associated with them, such as videoconferencing and distance learning are examples of the e-tivity tools. E-tivities are often spoken of in a particular context, such as ICTs in education, health care, or libraries.

ICTs stand for information and communication technologies and are defined, for the purposes of this primer, as a “diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information.” These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony. Bennet, R. (1997).

In recent years there has been a groundswell of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings. But e-tivities are more than just these technologies; older technologies such as the telephone, radio and television, although now given less attention, have a longer and richer history as instructional tools. For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominant delivery mechanism in both developed and developing
countries. The use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access.

Moreover, different technologies are typically used in combination rather than as the sole delivery mechanism. For instance, the Kothmale Community Radio Internet uses both radio broadcasts and computer and Internet technologies to facilitate the sharing of information and provide educational opportunities in a rural community in Sri Lanka. Similarly, the Indira Gandhi National Open University in India combines the use of print, recorded audio and video, broadcast radio and television, and audio conferencing technologies.

2.3 E-tivities in education

E-tivities plays an important role, especially in the process of empowering the technology into the educational activities. Education sector can be the most effective sector to anticipate and eliminate the negative impact of e-tivities. E-tivities (internet) can be the most effective way to increase the student’s knowledge Roschelle, (2000).

According to Lagrange, (1994) e-tivities have positive impact on students’ performance in schools. Schools with high levels of e-gadgets perform much better as compared to those with limited ICT gadgets. Pupils are more motivated to use e-tivities tools and subsequently they do better in Education, Lagrange, (1994).

Being aware of the significant role of e-tivities in our life, especially in the educational activities, education authorities should be wise enough in implementing the strategies to empower e-tivities in supporting the teaching and learning process in the classroom. E-tivities is not just the bloom of the educational activities, but also it will be the secondary option to improve the effective and meaningful educational process.

The main purpose of the Strategy for e-tivities is to provide the prospects and trends of integrating e-tivities tools into the general educational activities.

There are some unavoidable facts in the modern education;
First, do not bold the e-tivities has been developing very rapidly nowadays. Therefore, in order to balance it, the whole educational system should be reformed and e-tivities should be integrated into educational activities.

Second, the influence of e-tivities, especially internet (open source tool) cannot be ignored in our student’s lives. So, the learning activities should be reoriented and reformulated, from the manual source centred to the open source ones. In this case the widely use of internet access has been an unavoidable policy that should be anticipated by schools authorities.

Third, the presence of multimedia games and online games through internet has been another serious problem that should be wisely handled by the educational institutions. The students cannot be exterminated from this case. They can have and do with it wherever and whenever they want. Schools, as a matter of fact, do not have capacity and time to prevent or stop it after school times. Meanwhile, most parents do not have enough times to accompany and control their children. So, the students have opportunities to do with multimedia games or online games or browsing the negative and porn sites. Having been addicted, the students will have too little time to study, and even do not want to attend classes.

In such situation, education institutions play an important role to eradicate these problems. One of which is by facilitating the students to do edutainment or educational games. Schools can let their students be familiar with educational games adjusted by their teachers. Besides, they can also support and facilitate their students to have their own blogs in the internet. A lot of Weblog providers are free to the users, such as WordPress. In their blogs, the students can create and write something, like an article, poem, news, short stories, features, or they can also express their opinion by an online forum provided in the internet. They are able to share experiences throughout their blogs to others from all over the world. I think it will be an interesting activity for them, and it will lessen their time to visit the negative or porn sites existed.

By doing so, our young generation will get more and more information and knowledge by browsing in the internet. They can also create innovation in web design that it may be out of the formal curriculum content, but it will be useful for their future.
Fourth, the implementation of e-tivities in education has not been a priority trend of educational reform and the state paid little attention to it. Therefore, there should be an active participation, initiative and good will of the schools and the government institutions to enhance e-tivities implementation at school.

Fifth, the teachers should be the main motivator and initiator of the e-tivities implementation at schools. The teachers should be aware of the social change in their teaching activities. They should be the agent of change from the classical method into the modern one. They must also be the part of the global change in learning and teaching modification.

The followings are the aim and objectives of e-tivities implementation in education:

1. To promote the principle of life-long learning / education.
2. To increase a variety of educational services and medium / method.
3. To promote equal opportunities to obtain education and information.
4. To develop a system of collecting and disseminating educational information.
5. To promote technology literacy of all citizens, especially for students.
6. To develop distance education with national contents.
7. To promote the culture of learning at school (development of learning skills, expansion of optional education, open source of education, etc. (adapted from Saverinus Kaka, 2008.)

When used appropriately, different e-tivities can help in expanding access to education, strengthen the relevance of education to the increasingly digital world, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life. The government is well aware of the potential of e-tivities to help address some of the above challenges. (Chindaro, 2015)

The recognition of the prominent role which e-tivities can play in improving education in Zimbabwe was signified by the establishment of a fully-fledged ICT ministry. Awareness at the
highest level has been demonstrated by the launching of programmes such as the “Presidential e-Learning Programme”, “Presidential Computerisation Programme” and opening of e-Learning Centres across the country. Embarking on e-tivities projects without clear policy directions will result in stunted development. (Chindaro, 2015)

It is argued here that the lack of a clear and dedicated body that specifically deals with e-tivities in education in Zimbabwe has been hindering the government’s noble objectives, and will continue to do so if not addressed by the government. Any significant e-tivities enabling education initiative has to integrate within the national education systems and needs to be developed on a national scale, for it to work sustainably. Efficient integration of e-tivities in education requires a unified strategy for the whole sector.

The fundamental purpose of producing a specific policy would be to articulate and clarify goals and to provide a conceptual framework to guide progress towards the use e-tivities in education goals. Only a systematic approach can ensure that e-tivities educational goals are met in the best possible way, and the hard to reach are educated in an effective way. If appropriate objectives are set to meet the overall goals, the outcome of this strategy will become realistic and measurable; resulting in people involved getting a clearer picture of the steps to follow and the rationale behind doing so. The current lack of a coherent policy is likely to contribute to the development or prolonged existence of ineffective infrastructure and a waste of resources if not addressed. E-tivities in itself is not going to radically change education systems for the better Gowl, (1996).

An overall view of what education should be seeking to achieve is needed for ICTs to be utilised to their full potential within education systems. In Zimbabwe, the outgoing ministries of and education between them failed to incorporate e-tivities in the curricula, and, therefore, the integration of e-tivities in education and learning remains largely un-initiated. The fundamental issues of e-tivities in education development and integration cannot be resolved in isolation and, therefore, require a co-ordinated framework that establishes clear goals and priorities for reform. Zimbabwe does not have a dedicated national policy on the use of e-tivities in education.
A targeted in e-tivities education policy can open ways in which the sector can strategize and explore alternate affordable solutions. The development and integration of e-tivities in education need to be spear-headed by staff equipped with the specific skills for the role. It is clear that the skills and experiences in the areas of educational technology, e-tivities policy formulation and planning, e-learning, and digital content creation are a prerequisite if education is going to benefit from this technology.

E-tivity tools-use in relation to other factors in the instructional environment. This part shifts the focus of inquiry away the e-tivities tools and their effects to how these tools interact with other elements during the instructional process.

Leong and Lim-Teo (2003) studied the relation between Sketchpad use and the instructional approach adopted in the classroom. The students were taught the same topics in transformation geometry, but Sketchpad was used differently in the three classes. Although the test scores did not reveal any significant differences in conventional achievement, there were differences between the responses of students. Students who used Sketchpad in a guided-inquiry and exploratory setting tended to develop stronger concept images of the underlying geometrical ideas. In other classes where the method of classroom instruction did not suitably harness the advantageous features of the technology, there was a comparative lack of depth in student’s learning.

Some writers have highlighted the problems when e-tivities are viewed against the backdrop of other complex instructional issues. Ang (2006) surmised that although there are many ways e-tivities can be utilized in classroom teaching, teachers are required to look into other aspects of teaching, such as examination-relevance.

Technical glitches associated with e-tivities use are also not trivial problem. As in Chua’s (2006) study of students using video conferencing, lapses in hardware or software can cause considerably frustration to students and impinge on their learning when they are unable to keep up with a disrupted lesson. Therefore, the stability and robustness of computer systems is another important consideration when implementing technology-based lessons.
E-tivities are still a challenge to most teachers. When they bring technological tools into the classrooms, there was more complex instructional than originally intended. Change in teaching learning activities can pose significant challenges for the teachers and the students too. Olive, (1998).

The close relation between e-tivities use and other complex instructional elements in teaching could explain why there is yet little evidence to suggest a widespread integration of information in Singapore classroom. Study by Leong (2003) about the use Sketchpad gave result that 33 out of the 44 teachers indicated that they had used Sketchpad at some parts in their teaching. They preferred teacher-controlled demonstration than mode of Sketchpad. Thus, the full power of Sketchpad and its potential to transform classroom into lab-like places for students’ inquiries were generally not realized among schools that participated in the survey. It leads to the general conclusion that e-tivities use may be less of “integration”.

Another instructional element is the attitude of teachers towards e-tivities, as teachers’ beliefs about educational change directly affect implementation of new initiatives. To ascertain teachers’ attitude toward CAS, (2003) developed a 40 item CAS Attitude Scale (CASAS). Ng also developed the Crucial Factors in the integration of e-tivities Survey (CFS). According to the result of his study, it gives some indications to the direction in which the overall environment for e-tivities integration needs to be developed.

2.4 E-tivities and Mathematics

Pragmatist emphasise that the use of e-tivities tools when teaching Mathematics promotes critical thinking, problem solving and collaborative learning. Thus students when they use e-tivities tools they know how to learn and not only what to learn (Forman and Pufall 1988). According to Newman and Griffin (1989) use of e-tivities tools enables pupils to learn by doing. As they manipulate e-tivities tools such as calculators or computers they internalise some concepts and thereby understand much better. Since e-tivities appeal to the five senses, as pupils will hear, see and at times see things in motion, the chances for them to internalise the concepts are high.

Daniel, (2005) explain how e-tivities tools can promote good teaching of Mathematics concepts. They argued that e-tivities can change the pace at which the lesson might unfold and can be a
chief source of motivation among learners. E-tivities can promote independence and also promotes individualised learning. Also Mathematical symbols can be well presented using e-tivities tools where the actual drawing of maths images such as shapes can be best presented when one uses e-tivities tools such as a laptops and interactive boards.

The concept of e-tivities integration in instruction promotes:

- quality education (Mavundutse, 2005)
- increases participation on the part of the learner
- better understanding of Mathematical concepts
- Motivational learning environment
- Child centred pedagogy

Adapted from Satamwe (2014).

2.5 Visual Literacy in Mathematics

As discussed in the Ted Talk below (see ST Maths), words can be a major hurdle for students to achieve success in Mathematics. Therefore it is important that teachers attempt to teach Mathematics using the most visual and practical approaches possible.

![Types of Numbers](image)

**Figure 1. Types of numbers**

The different ways that numbers can be categorised.
1. How to identify and complete number patterns and sequences such as square, cubed, triangular, prime and composite numbers.
2. As discussed in the Ted Talk above, words can be a major hurdle for students to achieve success in Mathematics.

The children will much more focused on the teaching point when an interactive whiteboard is being used than on occasions when it was not being used. The same will be true when children were working on their own on a computer, there were more periods of intense involvement than when using more traditional pen and paper activities. However there will be one significant observation; that the software must be challenging, not too difficult or too easy. When the software is easy the children would click randomly to finish the activity. Also where the software is multiple-choice children clicked through each answer until they found the correct one without working out a single answer! The involvement level when working in pairs and small groups will not significantly affected by e-tivities. (Sharon Allcock 2013).

E-tivities to support the teacher – helping in the preparation of teaching materials, providing a flexible and time saving resource that can be used in different ways. It allows the teacher to save time on preparation of resources and to share expertise. This expertise can either be in mathematics or e-tivities or both, in any event it goes to support teachers (Vincent and Jones, 2008).

E-tivities impact on knowledge acquisition. The benefit of technology in education have been lauded for many years. Edison (1910) claims that, film would transform education making book obsolete to the most recent phenomenon of using the internet for instructional delivery.

There is mounting evidence that technology improves students’ achievements in the learning process. According to a study done by Gulek (2005) one of the major areas in which students improved greatly was a quality of writing and grammatical construction and pronunciation of words. Thus the use of e-tivities tools during instructional delivery facilitates reading skills.
E-tivities Koendonger (2009) postulates that, pupils with dyslexia improved significantly in reading ability. Besides that pupils or students who use computers during instructional delivery become motivated to learn and are willing to share information.

According to Duma and Monad (2009) of Hungary discovered that pupils through the use of technological devices develop collective knowledge. In particular pupils through cloud based services can easily lead and send feedback. Thus the use of e-trinities tools increases social interaction among the pupils as they share interesting wants as they learn.

Horan, (2009) propounds those stories of hospitality in multiracial kindergarten plays a pivotal role in instilling basic social skills. In this case pupils get to understand each other cultural dynamics. In other similar study Koedonger (2008) acknowledged that use of videos clips in teaching and learning enable pupils to develop the skills of analysing and interpreting events or situations. In addition pupils will be in a position to solve problems. For instance in the event that, a television set is fading to switch on because of improper insertion on the adopter, through intellectual capability pupils can probe the cause and rectify. Thus e-trinities tools enhance cognition developments.

According to Koedonger (2008) in a study he carries out, computer aided instruction especially, when used for drill and practice as a tool for teaching is a traditional sense allows students to take control of the rate of learning and help them avoid embracement’s by allowing them to learn and make mistakes in a non-public manner. Thus errors are private events that are usually quickly resolved and enable pupils to make progress.

Hannefan (2001) confined that, improvements in writing when utilising technology has been noted in pupils with special needs and low achievers. Similarly Koendger (2008), postulates that, computer assisted instructions provides feedback immediately which leads to reduction in learning time. As a result pupils fed more confident and leads to better attitude towards learning.

Classroom personal computers are a valuable e-trinities device in the teaching process. According to Kathleen (2012) through accessing computers, learning takes a whole different dynamics. For instance, teacher can allow pupils to follow writing lessons initiate actions and motions. In particular Kathleen (2012) asserts that projector is another technological device that can be used in a classroom. Projector enables pupils to view a larger screen, meaning a larger
screen than what is on the laptop. As a result it enables pupils to follow the teacher in learning process.

In another study, Meander (2012) propounds that, smart boards are fantastic way for pupils to stay engaged in lessons. It promotes the interaction between the teacher and learner. Equally important Meador outlined that a digital microphone enable pupils to hear clearly form the teacher and it draws pupils listening skills. Additionally, microphone plays a pivotal role it enhances or modified voices for pupils with special needs such as hearing problem. Microphone helps the pupils to pose questions to the teacher. It also facilitates classroom debates to be clearly heard.

Geata, (2011) and Meador, (2012) conducted a similar study in the use of tablets during instructional delivery. In their findings a tablets has been noted as a light and have some application as personal computers can enable or facilitate the learning process as pupils can view clips, hear voices recording. As a result it has been noted that, such devices attract learner’s attention and pupils can easily manipulate the gadgets for effective learning. In the cases of tablets, pupils can continuous watch the video clips or hear voices recording of rhymes, poems and songs.

In a recent study Meodor , (2012) acknowledges that, a digital camera is of paramount importance during instructional delivery as it engages pupils into variety of learning process. Through the uses of digital camera the teacher can assign pupils to roleplay scenes and then record those scenes to play back and discuss different aspects of each particular scene. As a result digital camera, enhance effective learning during instructional delivery.

In short explicit interactive instruction is the most useful and engaging way to reach pupil. However the researcher intends to utilise e-tivities tools during instructional delivery, such incorporations enhances effective learning.

E-tivities is just another, albeit very powerful, resource which mathematics teachers will need to consider when planning work for students inside and outside mathematics lessons. Of course finance for resources is finite. But there has been a huge public investment in e-tivities hardware, software, support and training for education which is ongoing. Parents, students and facilitators have a right to expect that teaching of all subjects in the curriculum should make the
best possible use of e-tivity resources, and that means that the selection and deployment of e-tivities resources should be made to fit the needs of the subject – and not the reverse. The test of whether it makes sense to deploy e-tivities is a simple one: “Does it benefit the students’ effective learning of mathematics?

Developments in the use of e-tivities have been very rapid, and in general costs have fallen considerably, so it is now the case that many homes contain more powerful e-tivity resources than are currently available to many teachers of mathematics in schools and colleges. Many common e-tivity tools have been developed for personal use, and their deployment in a teaching environment requires careful consideration. In business it is a common rule of thumb that hardware accounts for less than half the investment in e-tivities, and that investment in hardware is of very little use without investment in appropriate software, as well as training and support.

Unfortunately a culture has arisen in education in which the provision of resources to support the acquisition of appropriate curriculum software lags far behind that of hardware, which often comes with a range of so-called ‘generic’ software bundled-in. In section 2 we give a review of the many software tools which have already been developed to support teaching and learning of mathematics. Most of these have been widely available for some considerable time at a relatively modest cost. Inspection evidence consistently shows very little use of appropriate e-tivity tools in mathematics teaching at all levels. Reasons for this may include:

(i) lack of support and/or training,
(ii) lack of funding devolved to mathematics departments,
(iii) scepticism about benefits of using ICT and ,
(iv) Lack of knowledge of what is available.

We hope this guidance will help enable you to articulate your needs in a way which may improve the situation with respect to (i) and (ii). If you feel you don't know what e-tivities resources are available or the benefits of their use to teachers and learners, then we hope that this guidance will contribute to improving your knowledge. For a guide to the funding sources currently available to all maintained schools in England see the article `what would it take to get e-tivities established in the mathematics department? The most recent Ofsted report `Mathematics in secondary schools’ Edward,(2002). It summarises the present situation and does not find the overall picture very bright! One if its main findings are that:
“Despite significant government funding, the use of e-tivities to promote progress in mathematics remains a relatively weak aspect of provision. Its use is less effective than in many other subjects and is unsatisfactory in one school in three.”

It continues:

“The use of e-tivities to support teaching and learning within mathematics remains underdeveloped. While there are examples of good practice, there are significant inconsistencies between schools as well as within mathematics departments. A minority of teachers are still not confident in the use of e-tivity tools and require further training. In some schools and colleges, access to e-tivities facilities, including graphing calculators, is too limited and an appropriate range of software has not been made available. In other places, where resources are adequate, they are often not used frequently enough or to promote better teaching and learning”

The Ofsted report - Edward,(2002) “The characteristics of good general secondary provisions include:

- availability of different groupings of resources to match the needs of departments, for example computer rooms, clusters of machines and individual workstations around the site
- computers networked and well maintained with good Internet access from all workstations
- well-lit, comfortable computer rooms with sufficient space for pupils to work away from computers and for teachers to circulate and talk to individual pupils
- effective communication with the whole class using digital projectors or the capacity to control all the computers
- An efficient and equitable booking system for computer rooms.

Increasingly schools are exploring the possibility of greater flexibility in serving subject needs through the use of wireless links between banks of laptops, managed centrally and linked to the school network.”

The Ofsted report -` E-tivities in Schools’ (2002)
2.6 Challenges of Using E-tivities tools during Instruction

There is overwhelming awareness that there are great potentials in the availability and use of e-tivities. The use of e-tivities facilitates teaching and learning process. However, there are several studies that discovered a chain of hindering factors in the use of e-tivities.

Roblyer and Edward, (2002) conducted a survey in USA high schools to establish some of the challenges associated with the use of e-tivities. They discovered that insufficient use of e-tivities at some schools triggered the ratio of students per single computer to be very higher. In addition lack of free time by both teachers’ and students to use computers has been cited as a major problem. In this case lack of free time for further researches in the position of teachers resulted in poor lesson delivery. More importantly Roblyer and Edwardd (2002) discovered that some of the school are still using obsolete computers. Such computers take long to connect to the internet due to its out dated software and some of the schools does not have electricity.

The above challenges might be relevant to my research in the sense that, at Kuwadzana 1 High. Besides that the teacher and pupils do not frequently use e-tivities due to unlimited space and unavailability of reliable computers that can swiftly connect to other internet.

In a similar study conducted more recently by Jones (2004) in United Kingdom, he cited that lack of technical support or those with experiences to run computer labs leads most schools to run on outdated and unreliable operating software. Besides that Jones ,(2004) also discovered that lack of personal confidence and sufficient access to e-tivities resources were challenges experienced by majority of surveyed teachers. While on the other hand resistance to change by some of the teachers and lack of beneficial value e-tivities adds to teaching and learning left other teachers resorting to traditional model of teaching.

Similarly in the study by Roblyer and Edwards, (2001) in New Zealand, they observed that, lack of time for professional development to learn about the new technologies derailed the use of e-tivities during instructional delivery. Equally import, lack to time to explore technologies such as internet, social networking services were reported as significant barriers for using e-tivities in the classroom. In brief Roblyer and Edwards, (2001) noted that lack of contentment’s with current approaches and lack of confidence to integrate e-tivities in the curriculum were reported to as key challenges experienced by the teachers in the New Zealand.
In other study by Salchi and Salehi, (2012) investigated the perspective and challenges preventing to integrate e-tivities in the classroom. In their study Salchi and Salehi, (2012) a validated questionnaire was administered to thirty (30) schools randomly selected in five main districts of Isfahan Iran. The findings indicated that, although teachers had a strong desire to use e-tivities in the classroom they encountered some barriers. Insufficient technical support at schools and little access to internet were considered as the major barriers preventing teachers to integrate e-tivities during instructional delivery. Additionally, a shortage of classroom computers was another barrier discouraging teachers to use e-tivities in the classroom.

Furthermore, also relevant to the study is a research carried out in Philippines by Salchi and Salehi, (2002). In their study they noted that major obstacles to utilise e-tivities in the teaching of Mathematics in most schools had been lack of timely technical support. In some extreme cases usually schools in some remote areas disabled computers take months to be repaired since no technicians is available within the vicinity. Thus the computer has to be send to nearest city hundreds of kilometres away.

According to Blantz, (2010) in a study he carried lack of constant and affordable electricity is the single greatest challenge in designing e-tivities infrastructures. Unreliable and unstable power supply poses threat to electronic equipment, in particular computers and other technological devices.

Regionally similar studies were conducted to establish challenges facing the integration of e-tivities tools during instructional delivery. Thus African countries still experience a lag in its policy implementation of educational goals. As a result continues to widen the digital and knowledge gap.

In a recent study conducted by Koptlan et al, (2010) of Nigeria, accessing the computer as e-tivities tools is still a major problem in Nigerian schools, particular rural and some urban schools. Kiptlan et al, (2010) observed in most schools a single computer accommodated at least one hundred and fifty leaners against a ratio of one as to fifteen (1:15) learners in developed countries.

Wabuyelo,(2013) says ,the use of e-tivities tools during instructional delivery shows that the governments of Kenya is still lagging in its implementation of e-tivities in teaching and learning.
The study found that computer use in Kenyan classroom is still at its early phases and concluded that the properties and experience of teachers and administrators do not play an important role in the use of computers.

In a similar study a number of problems militating against e-tivities use in Nigeria have been cited by Okafar (2010) who observed that the major problem is that the use of computers accessing the internet and other tools of e-tivities are limited greatly to the urban areas. While on the other hand, the rural community is still lagging in its use of computers

In his study Mungari,(2011) identified the following as challenges faced when rolling out e-tivities programs in schools

1. **Lack of qualified teachers to teach e-tivities in schools**; the demand for e-tivities learning has been tremendous and the number of teachers who are trained to teach e-tivities cannot meet the demand. There are more students willing to be taught computing skills than there are teaches to transfer the skills.

2. **Lack of computers**; E-tivities infrastructure are still very expensive and despite spirited efforts by the government agencies, NGO, corporate organizations and individuals to donate computers to as many schools as possible, there still remains a big percentage of the schools unable to purchase infrastructures like computers for use by their pupils.

3. **Lack of electricity**; many schools are still not yet connected to electricity; Kenya being a developing country, the government has not been able to connect all parts of the country to the national electricity grid. Consequently those schools that fall under such areas are left handicapped and may not be able to offer computer studies.

4. **Computers are still expensive**, in a country with a GDP of $1600, majority of the individuals and schools cannot afford to buy a computer and consider it as a luxury item, more expensive than a TV. While 2nd hand computers cost as little as $150 and branded new computers being sold at $500 or higher.

5. **Broken down computers**; while a good number of schools have benefited from donated used computers, they have not been adequately equipped with the same on maintenance and repair, hence its very common to see a schools computer lab full of broken down computers, some repairable and some not. This has actually been a
major problem, and the government has now put strict measures on any person, NGO or corporate bodies willing to donate 2nd hand computers. (It is seen as a dumping ground); e-waste Mungari,(2011).

Locally similar studies were carried out to establish the challenges of using e-tivities in teaching and learning process. Kessy, Kaemba and Gochoka, (2006) and Ford (2007) discussed several factors that hinder the use of e-tivities in the African context. In their findings cost of adapting e-tivities including acquiring hardware and software, setting up telecommunication network and maintenance and repair of facilities is often prohibitions for developing nations. Additionally Kessy etal. (2006) cited poor infrastructures, unlimited electricity supply as major hurdles directing the implementations of e-tivities.

Zimbabwe has been beleaguered by economic and political turmoil in recent years which has debilitating effect on its already declining education system. Shafika, (2007) observed that Zimbabwe does not have a dedicated specific national policy on e-tivities in education. There is little digital education contents based on the local curriculum framework available in Zimbabwe.

Zimbabwe National Information Communication Technology Policy frameworks (2005) acknowledge that they are still problems facing the e-tivities sector including education. Especially trying to integrate e-tivities in teaching and learning. In brief a number of challenges have been noted inadequate communication infrastructures, inadequate e-tivities facilities, inadequate e-tivities skills, limited data management capacity and inadequate bandwidth nationally. In this regard most rural schools are ones hard hit as they do have the telephony to access the internet services and mostly rural schools experience erratic power supply.

In another study Ndlovu (2009) reported that, Zimbabwe just like most African countries basically faces a number of hurdles in order to roll out effective computing technologies to the general population. Cost of computers and equipment remain a challenge, besides that, Ndlovu(2009) noted that inadequate electricity supply, as the country faces a down and international bandwidth adversely hampered their integration of e-tivities in teaching and learning. Equally important brain drain played a pivotal role in derailing ICT integration in teaching and the general economic sectors. Thus brain drain leads to lack of skilled manpower.
Furthermore Ndlovu (2009) cited that lack of telecommunication infrastructures makes it difficult for remote areas to access the internet because the telephony infrastructures are inexistence. Similarly Kachembere (2011) mentioned that, internet access is a major obstacle, due to other limited national and bandwidth cables. In some cases the cost of computers, equipment’s and software is a stumbling block in e-tivities developments.

In Zimbabwe some of the challenges include lack of commitment on the part of the school admin to purchase e-tivities tools to be used in schools such as projectors and computers which are key to the effective rolling out of e-tivities programmes. Related to this is the issue of attitude among the teachers, given a choice most teachers opt for the traditional way of presenting data to pupils leaving out the contemporary approach to teaching and learning where e-tivities tools are used. This attitude problem is also shared among the administration staff who given a chance would craft a school budget with nothing on etivities tools. They see purchasing e-tivities tools as an unnecessary extra burden given a chance can be left out.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this research, the researcher discloses the different research methods or data collection instruments used to collect data in a bid to investigate the impact of e-tivities in the teaching of Mathematics at Advanced level. This chapter is going to discuss on research methodology, research design, population, sampling, research instruments and lastly a brief summary of the chapter. Methodology refers to the systematic investigation of an issue to collect important data. Shepand, (2002). According to Gray (2009) research methodology is a plan that shows how a researcher intends to fulfil the goal of a proposed study. This seems to imply that methodology involves a systematic planning which also involves the understanding of how knowledge of a phenomenon is discovered. This study intends to employ qualitative methodology with a few aspects on quantitative research. The qualitative approach was chosen due to its strength in giving detail and explaining issues fully in this case how e-tivities tools strengthen instructional delivery. Strauss, A. and Corbins, T. (1998).

3.2 Research Design

Leedy (1980) defines research design as a strategy, the plan and structure of conducting a research project. Corrigan (2000) describes a research design as the strategy, the plan and the structure of conducting a research project. According to Leedy (1970) research design are strategies and plans of carrying out a project. Best and Khan (1993) advocates that research design is a systematic and objective analysis of observations that may lead to the development of generalisations or theories resulting in predictions. In other words, a research design is a plan or a structure for investigations. It is a set of plans and procedures that reduce error and simultaneously help the researcher obtain empirical evidence (data) Helper, (1992). Thus research design is the plan, structure or strategy of investigation conceived so as to obtain data and how it is interpreted. Both qualitative and quantitative methods of user research play important roles in product development. Data from quantitative research—such as market size, demographics, and
user preferences—provides important information for business decisions. Qualitative research provides valuable data for use in the design of a product—including data about user needs, behaviour patterns, and use cases. Each of these approaches has strengths and weaknesses, and each can benefit from combining them with one another. This study employed both quantitative and qualitative methods. While quantitative and qualitative research approaches each have their strengths and weaknesses, they can be extremely effective in combination with one another. You can use qualitative research to identify the factors that affect the areas under investigation, and then use that information to devise quantitative research that assesses how these factors would affect user preferences.

**Case Study move to research design**

McLeod, (2008) defines a case study as an in-depth investigation of a single person; group, even or community sharing the same view, Yin, (2009:4) maintains that a case study is a detailed examination of any setting or a single subject, a singular depository of documents or one particular even. Typically data was gathered from a variety of sources and by using methods such as interviews and focus group discussions. This assured triangulation of methods of data collection. Case studies allows a researcher to investigation a topic in a far more detailed than might be possible if they were trying to deal with a large number of research participants.

The case study has disadvantages too. One of the disadvantages is that there is bias in interpretation since the outcome of the study depends on interference that can be drawn by the researcher who is both a participant and observer. Also results from case studies cannot be generalised to the wider population Mcleod, (2008). Because a case study deals with one person/event/group we can never be sure whether conclusions drawn from this particular case apply elsewhere. The results of the study are not generalised because we can never know whether the case we have investigated is representative of the wider body of “similar “instances.

However it should be noted that the results of the study are sufficient and appropriate for students and lecturers working in a similar situation and can relate the work and decisions based on findings in a given case study. According to Bassey in Bell (1993:9) the reliability of a case study is more important than its generalizability. Bassey (1993) further argues that if case studies are relatable and if by publication of the boundaries of existing knowledge then they are valid forms of educational research. If case studies are carried out systematically they improve
education. Lancy, (1992). Case studies allow a lot of detail to be collected, the data collected is normally a lot richer and of greater depth than can be found in experimental designs. Since the researcher was dealing with social and psychological phenomenon, a case study was ideal as it permit investigation of impractical (unethical) situations. Polit and Hungler (1983: 87) reveal that the information obtained in case studies can be extremely useful in the formulation of hypotheses to be tested more thoroughly in subsequent research. Case studies often lead to insights concerning previously unsuspected relationships due to intensive probing which characterize them.

3.3 Quantitative Studies

“Statistical analysis lets us derive important facts from research data, including preference trends, differences between groups, and demographics.” Quantitative studies provide data that can be expressed in exact form—thus, their name. Because the data is in a numeric form, we can apply statistical tests in making statements about the data. These include descriptive statistics like the mean, median, and standard deviation, but can also include inferential statistics like t-tests, ANOVAs, or multiple regression correlations (MRC). Statistical analysis lets us derive important facts from research data, including preference trends, differences between groups, and demographics. Multivariate statistics like the MRC or stepwise correlation regression break the data down even further and determine what factors—such as variances in preferences—we can attribute to differences between specific groups such as age groups. Quantitative studies often employ automated means of collecting data such as surveys, but we can also use other static methods—for example, examining preferences through two-alternative, forced-choice studies or examining error rates and time on task using competitive benchmarks. Quantitative studies’ great strength is providing data that is descriptive—for example, allowing us to capture a snapshot of a user population—but we encounter difficulties when it comes to their interpretation.

3.4 Qualitative research

Strauss,(1990) submits that qualitative research is a form of systematic empirical inquiry into meaning. On the other hand Densin ,(1970) claim that qualitative research involves an interpretive and naturalistic approach. In this regard qualitative research sought to study things or phenomenon in its natural setting. Qualitative research aims to make meaning based on
observable behaviours. Qualitative research is a process of systematic inquiry into meaning people employ to make sense of their experiences and guide their actions. In this regard the researcher intends to establish how ICT tools strengthen instructional delivery. Qualitative data will be established on how the ICT tools strengthen instructional delivery. Qualitative research tools such as interviews and focus group discussion were employed.

According to Barker et al., (1995:72) qualitative research has a lot of advantages. It enables the researcher to have an in depth inquiry into the matter under study. Furthermore, a qualitative research method enables the researcher to study more complex issues or aspects of experiences. Through the use of qualitative methods the research was able to generate qualitative data of the impact of ICT tools on instructional delivery. However, Mclead (1994) asserts that qualitative methodology has limitations too. Qualitative research is constantly criticised for its inability to generalise conclusions. However, the researcher opted for this design due to its flexibility in data collection. Since the researcher was the key instrument in the study, when it happened the researcher was there. Qualitative methodology ensured an in depth study of the impact of ICT tools to instructional delivery.

3.6 Population

Population is generally a collection of individuals’ objects that is the main focus at the study, Leddy and Omrod (2009). According to Best and Khan (1993) population is a group of individuals that have one or more characteristics in common which resulted in teacher’s interest. Siidhu (1997) supports this idea saying population is a group of individuals that are of interest to the researcher. Crawl (1996:8) described population as a group consisting of all people whom the researcher wishes to apply here findings. Therefore the researcher views population as a group of people having something in common resulting in them being realised as a group at a particular time and station for example purpose of searching for information.

The population of the study constituted 50 teachers and 12 student teachers. The school has 1 500 pupils.
3.7 Sampling
According to Yin (1994) a sample is a subset of persons selected from the population. A sample size is relatively small, but selected from the larger population. David (1997:102) defines a sample as a smaller group drawn from a population carefully selected in order to closely reflect the characteristics of the subjects. In the same vein, Leedy, Z. (1970) describes a sample as a group of a target population understudy. In this case, a sample is a small and manageable group of individuals which is selected from the population in a systematic way. It is therefore clear that the researcher cannot study all pupils. This would result in group far too large to manage.

3.8 Sampling Procedure
The sample of 51 A level students was used as it is small but purposively selected to be representative of Kuwadzana 1 High school. 15 Teachers were also selected as participants in the research. In this case the sample size creates opportunity for the researcher to closely monitor and test the hypothesis in order to attain the purpose of the study and its objectives. Furthermore, the researcher opted for purposive sampling for it is the most suitable strategy for group participation Borley, (1998).

3.9 Research instruments
Research instruments refer to devices used by the investigators to collect credible data. According to UNSECO (2002) research instruments are tools which the investigator uses to collect data from the participants. In this study the researcher used structured interviews and focus group discussions. The questionnaire captured the information on student’s age, sex and their feelings towards the Mathematics lesson with E-tivities, available at the school and also when did the students started to use E-tivities. The questionnaire also captured questions on whether the students enjoy and understands lessons taught using E-tivity tools or not.

3.9.1 Structured interviews
An interview is a face to face conversation expressed academically Kitten (2001). An interview provides a method for data collection that involves presenting oral verbal stimuli and collecting verbal responses. As a method interviews can be a social platform on which information can be shared freely in a relaxed atmosphere. The researcher opted for the structured interviews since it has the capacity to elicit responses that can be recorded and be put in categories and can be coded.
Structured interviews are carefully worded questions structured to obtain valuable data. Structured interview questions are generally specific and are well structured to obtain correct responses. This is a good example of a qualitative tool of data collection. In a structured interview, personal and more complicated questions can be discussed more easily. In this study structured interviews were used. A structured interview is also called standardised interview. The same questions are asked to all respondents with the same wording and the same sequence Hurberman,(1994). The reason for using structured interviews was to allow the same context for the interviewees. This means that all interviewee receives the same stimulus as any other. The goal was that the responses of interviewees can be aggregated and thus easy to analyse. Gray,(2003) maintains that the strength of structured interview is that the researcher has control over the topics and format of the interview. This is so because a detailed interview guide is always used to solicit information. However, structured interviews have some disadvantages too. Staker (1995) asserts that structured interviews can be time consuming if not properly managed. Structured interviews need well qualified and highly trained interviewer. If it is randomly conducted data collected can be misleading. Loftland (1995) outline that in a structured interview; the flexibility involved can lead to inconsistencies in data. A lot of data can be collected which requires systematic arrangement and analysis.

3.9.2 Focus Group Discussion

Miles and Huberman (1994) assert that focus group combine elements of both interviewing and participant observation. The focus group session is indeed an interview. Loftland and Loftland (1995) persists that focus group capitalises on group dynamics. The dynamic nature of this method will set an environment which will allow the moderator to modify a question or discussion topic to suit the group or situation. Another advantage of focus group discussion is that it is a natural way of collecting data. Participants will speak their views in a natural setting. Focus group discussions can reveal a wealthy of detailed data and deep insights. If well executed a focus group discussion creates an accepting environment that puts the participants at easy allowing them to thoughtfully answer questions in their own words and add meaning to their answers Stake,(1995).Surveys are good for collecting information about people’s attitudes and attributes but if you need to understand issues more deeply and meaningfully use a focus group Parton,(1990).
However, the focus group discussion approach has its own limitations. Alexis (2010) laments that focus group are not as efficient as interviews in covering maximum depth on a particular issue. Also members in a particular group may be reluctant to openly share their views in a group setting, especially when their thoughts oppose another participant. Compared to individual interviews, focus groups are much more expensive to execute as each participant may need compensation in cash or kind. There is also bound to be moderator bias especially when the moderator leads a discussion into reaching a certain conclusion Parton, (1990). Also, Jones, A. (2004) posits that if the focus group discussion is not properly constituted, a few individuals may dominate the group proceedings at the expense of others. In view of this the researcher had to organise the focus groups so as to minimise dominance and bias on the part of the moderator.

3.9.3 Tests

Borg and Gall (2005) postulates that a test is any structural performance situation that can be analysed to field numerical scores from which interferences can be made about how individuals differ in the construct measured by a test. This therefore means the test measure the performance of individuals. The tests were used by the researcher after experimenting teaching using lecture method and interactive method using e-tivities in order to check whether pupils perform differently.

Advantages

- Tests showed the researcher learners consistence in performance.
- They acted as a stimulant as they encourage both the teacher and the pupil to improve their teaching and learning respectively.
- The tests explained performance that is, exposing weakness and strength in the learning of Mathematics.

Disadvantages

- Marking of tests is subjective to the marker’s feelings even when the marking guide is available.
- Performance and ability can be affected by social factors.
3.9.4 Questionnaires

Waxman and Mitchel (2003) revise referencing style defines a questionnaire as a printed form containing a set of questions especially significant number of subjects as was of gathering information for survey. Questionnaires are used in many different forms, from factual to opinion based from tick boxes to free text responses. The researcher used questionnaires in order to gauge learners’ motives, attitudes and general feelings towards the use of e-tivities in the teaching of Mathematics.

Advantages

- Questionnaires guaranteed confidentiality and this elicited more truthful response without fear of victimisation from despondence. Learners were able to give their views towards the use of E-tivities during a lesson on integrating functions. Pupils found it interesting when they appreciated the smart board software could integrate functions.
- It was a quick method of collecting data, so it took the researcher three weeks of gathering data since all the respondents were gathered at the same place.

Disadvantages

- The researcher could not probe for more feedback since respondents could only respond to restricted questions
- Some despondences were reluctant to answer all the questions and thereby leaving some questions unanswered.

3.10 INTERVIEW

An interview as a two person conversation initiated by the interviewer for a specific purpose of obtaining research relevant information focused on research objectives. The method thus involves gathering data though direct verbal interaction between individuals. The motive of the interview is to provide with subjects direct contact with researcher. The researcher used informal interviews to probe for more information from the Mathematics teacher so that he may
have a general overview of what was really the cause of poor performance by pupils in his subject areas.

Advantages

- The researcher got an opportunity to probe for more information from the horse’s mouth (mathematics teacher).
- The researcher got an opportunity to ask probing question in order to get comprehensive answers to questions.
- Unlike questionnaires, interviews allowed the researcher to explain and clarify questions that would be vague to the interviewee.

Disadvantages

- The interviews were time consuming to carry out.
- The respondent was not willing to answer some questions as he did not want to reveal some information.
- As noted by Borg and Gall (2005), since the interview is the best way through which the investigator can discuss delicate and controversial issues with the subject, and dig out the subject’s feelings, the researcher adopted the use of informal interview to offset the limitations of questionnaires.

3.11 OBSERVATION

This is a more natural way of gathering data. It seeks to ascertain what people think and do by watching them in action as they express themselves in various situations and activities. The researcher notices the everyday routines of those he/she wishes to study. The method is one of the best reliable means of data collection especially when dealing with a small group. Observations were done on both pupils under study and the school’s mathematics teacher when he was delivering his lessons.
Advantages

- The researcher was able to get first-hand information unlike in questionnaires and interviews where people were writing what they think enabling them to say differently from their actual behaviour. Thus data collected through observation was therefore likely to be more real and true than data collected through other methods.
- This data collection instrument did not disrupt day to day activities.

Disadvantages

- The subjects being observed may have modified their behaviour when they became aware that they are being watched. Therefore wrong information may have been recorded.
- Some activities were happening simultaneously resulting in the researcher failing to record all useful data.

3.12 DATA COLLECTION PROCEDURES

The researcher asked permission from the school administration and the mathematics teacher in order to administer the data collection instruments used. It was easy for the researcher to use questionnaires, tests and observation because he was directly in charge of targeted class.

3.13 VALIDITY AND RELIABILITY OF INSTRUMENTS TO BE USED

In the opinion of Brooker, L. (2003) reliability is “the degree to which measurement instrument gives the same result with being repeated measurements.” This assumes that whatever is being measured does not change. Also in the view of Sprinthall and Sprinthall (1994:427) validity is the extent to which a test measures what it is supposed to measure. To ensure validity and reliability the researcher made respondents to complete questionnaire in his presence and collected them immediately after completion. Also he advised the respondents not to write their names on the questionnaires and questions on the questionnaire were specific and deduced from the objectives.
3.14 CONCLUSION

Research methodology explains how the research was actually carried out. It reveals the research design used, the target population, instruments to gather data analysis technique to be used. It showed what happened in the field of research. The next chapter, the researcher will look at how data was analysed.
CHAPTER FOUR

Data Presentation, Analysis and Interpretation

4.1 Introduction
The chapter focuses on the presentation, analysis and interpretation of findings of the research having collected the data through use of questionnaires, tests, interviews and observations. The researcher used pie charts, tables, bar graphs and descriptive presentations to present the data. The analysis and interpretation was integrated in the presentation of the data obtained.

4.2 Questionnaires for learners
The questionnaire was designed to find out the pupils’ sex, age, when they started doing mathematics using e-tivities, their attitude and feelings towards the subject as well as what they think needs to be done to improve the teaching and learning process of mathematics using E-tivities. The researcher gave questionnaires to 51 Upper 6 pupils at Kuwadzana High 1 School in Harare.

4.3 Pupils’ sex, age and when they started doing Mathematics
Question 1, 2 and 3
In the form 6 Mathematics class fifteen respondents were girls and thirty six were boys. Out of fifty one pupils, four indicated that they were in the range of sixteen years, thirty eight pupils were in the range of seventeen years, and fourteen pupils in the range eighteen years. This means that all the respondents are mature enough to do mathematics as the subject at Advanced level. Thirteen respondents indicated that they started to use e-tivities tools in learning Ordinary level Mathematics. At ordinary level: forty eight respondents indicated that they started using e-tivities tools in learning Mathematics, (ZIMSEC Syllabus) at advanced level. Thus the use of e-tivities in learning Mathematics is a new aspect to the majority of the respondents.
4.4 Pupils’ Aspirations

Question 4

E-tivity tool/teaching method

From this question the researcher noticed that, the most of the pupils had interest in the learning of Mathematics using interactive boards, followed by WhatsApp groups, Google groups, projectors and google groups and only three respondents had an interest in the lecture method.

Table 1-E-tivity tools

<table>
<thead>
<tr>
<th>E-tivity tool</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive board</td>
<td>15</td>
</tr>
<tr>
<td>Projector</td>
<td>10</td>
</tr>
<tr>
<td>Google group</td>
<td>10</td>
</tr>
<tr>
<td>WhatsApp group</td>
<td>13</td>
</tr>
<tr>
<td>Lecture method</td>
<td>3</td>
</tr>
</tbody>
</table>

The information in the table above can be represented on a bar graph as shown below.

![Bar graph showing the frequency of different e-tivity tools](image)

**Figure 2. E-tivity tools**
The bar graph shows that most pupils favour the e-tivity tools than the lecture method. Thus, from these results, the researcher assumes that pupils are not motivated with the lecture method and this leads to poor performance especially in theory work which requires considerable effort in order to pass.

4.5 Media to learning

Question 5

Would you have chosen e-tivities tools as a media to learning of Mathematics if you had a choice?

The researcher discovered that, 44 pupils indicated that they would go for the use of e-tivity tools in the learning of Mathematics and 7 pupils indicated otherwise. This is shown below:

![Figure 3. E-tivity media](image)

From the findings this means that 14% of the pupils were not in support of the learning of Mathematics using e-tivities if they would have choice. The pupils should be given a platform where they are able to choose the media to use for effective teaching. Also amongst the whole class indicated “Yes” and this constitutes 86% of the class

Attitude towards the subject

Question 6

How do you feel when you are doing Mathematics using e-tivities
The response the researcher got from this question were that, 7 pupils were bored when doing Mathematics using e-tivities, 12 felt challenged and 32 interested. These results are shown on Table 2 and Figure 2 below:

Table 2. Response on E-tivity

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Number of response</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you feel when you are doing Maths with E-tivities</td>
<td>BORED</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>CHALLENGED</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>INTRESTED</td>
<td>32</td>
</tr>
</tbody>
</table>

Figure 4. Response on E-tivities

These results prompted the researcher to think that those learners who felt challenged and bored lacked some form of motivation from the school administration, teacher, parents and even from fellow pupils.
Ascertaining the availability of resources

Question 7

Indicate the learning resource which you can easily access

The results collected showed that 70% of the pupils had access to the operation of laptops. The laptops were used together with the smart boards, accessing internet used to access google groups and also used for WhatsApp. 20% had textbooks at their disposal and 10% indicated that had access to the use of the internet. This is portrayed in Figure 5 below:

Figure 5. E-tivities resources

The results indicates that better performance in practical work is being enhanced by the high access to computers and problems that are being faced in theory work as a result of limited access to textbooks and internet access which means shortage to some vital resources.

4.6 Teaching media

Question 9

Do you enjoy lessons when the teacher uses teaching media?
The researcher found out that, 48 respondents indicated that they enjoyed having a lesson whereby instructional media is used and only three indicated “No”.

The results are illustrated in Figure 6 below.

Figure 6. Teaching Media

The researcher is then prompted to assume that; e-tivity tools is of pivotal role in the teaching of Mathematics subject in order to enhance clear explanations, to awaken interest and curiosity among pupils thereby promoting effective teaching and learning process.

4.7 Deducing pupils ideas on how to improve teaching and learning

Question 10

What do you think should be done to improve Mathematics studies theory lesson?

Question 10 was an open ended question in which the researcher asked the respondents about what they think should be done to improve Mathematics theory lessons. The results obtained indicated that the respondents were of the opinion that the school authority should work towards buying some more textbooks and to increase the number of e-tivity tools. Most of them also cited that the teacher should improve in the teaching methods in order to avoid boredom.
4.8 RESULTS FROM INTERVIEWS (teachers)

The researcher managed to conduct on informal interview with the Mathematics teachers. He indicated that he had been teaching at the school for more than 15 years now.

**Question 1**

For how long have you been teaching Mathematics?

Results obtained showed that the first teacher was in the range 10-20 years. This shows that the teachers amongst one of the senior teachers and very capable of teaching the subject.

**Question 2**

What is the pupils’ attitude towards the subject?

The respondent concurred that most of the pupils had negative attitude of the subject if it is learnt using the traditional methods of teaching. This was attributed to the fact that the subject was a bit difficult for them. The use of E-tivities makes learning interesting to the students.

**Question 3**

Do you have adequate resources for the subject in the school?

Results obtained from the respondents showed that the school had only one lab which was to cater for the whole school, twenty textbooks for mathematics, forty computers and only four computers with internet. The respondents also highlighted that the school had Wi-Fi but it was of no use to students since they are not allowed to configure internet on laptops and even mobile phones. **Table 4 and Figure 7** show that the resources available at Kuwadzana 1 High School
Table 3. E-tivities resources

<table>
<thead>
<tr>
<th>RESOURCES</th>
<th>TOTAL NUMBER OF RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart board</td>
<td>6</td>
</tr>
<tr>
<td>Textbooks</td>
<td>20</td>
</tr>
<tr>
<td>Computers</td>
<td>40</td>
</tr>
<tr>
<td>Internet resources (computers)</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 7. E-tivities resources

Thus the researcher noticed that the department was also starved of the crucial learning resources.

Question 4

What teaching methodologies do you prefer when teaching Maths?

The respondent said he uses both the teacher centred and pupil centred methodologies to enhance the teaching and learning of Mathematics.
Question 5

What teaching aids do you use when teaching computer studies theory?

The respondent admitted the usage of the lecture method most of the time as well as charts at times. He supported the use of these aids saying that they are readily available. The researcher then assumes that they may be lack of creativeness in the teacher in the use of media which will enhance effective learning.

Question 6

What are your recommendations?

The teacher recommended the provision of adequate resources in order for the pupils to have adequate leaning resources and that pupil should try to work harder so that they may improve in their performance.

4.9 RESULTS FROM OBSERVATION

Observation Schedule

The observation aimed at observing pupils’ involvement, their participation media and teaching methods during lesson delivery.

4.10 Observation results

The researcher observed that the most teaching strategy which is used by the Mathematics teacher was mostly lecture method.

The researcher also managed to experiment the lecture method with the upper six classes he was teaching. The lecture method seemed not to be a very effective method as the researcher was able to observe the behaviours and attitude of the learners. Pupils would end up being disconnected and some of them were absenting themselves from lesson. Pupils did not do well also in the test that was written after teaching them using the lecture method.

The researcher also managed to change his teaching methodology to pupil centred. As he gave pupils homework, then during the lesson pupils were involved in group discussion and
questioning technique. The incorporated media used were interactive boards, work cards for group discussion purposes and charts to clearly show each and every network topology discussed. The researcher noticed that learners were actively participating during the lesson. They were eager to assist each other. Learners also responded very well to questions asked during the lesson. Learners seemed eager to learn and interest seemed to have been awakened and the researcher managed to capture the attention of the learners throughout the lesson. The test written after the interactive method was applied was done very well. This showed that there was very high retention rate among the learners.

From the above observation results, the researcher made an assumption that despite the fact that learners were randomly placed for practical subjects, the learners were highly motivated by learners cantered methodologies as well as use of instructional media, this is because the researcher observed learners reporting for the lessons well before the lesson begins and all learners would report for lessons. The only problem that was left was that of shortage of adequate learning resources.

4.11 RESULTS FROM TESTS
The researcher gave learners tests after employing both the teacher centred methodologies and the pupils centred methodologies.

Table 4- Results on the lecture method

<table>
<thead>
<tr>
<th>Mark Range</th>
<th>Number of Pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-49</td>
<td>8</td>
</tr>
<tr>
<td>50-59</td>
<td>35</td>
</tr>
<tr>
<td>60-69</td>
<td>2</td>
</tr>
<tr>
<td>70-79</td>
<td>1</td>
</tr>
<tr>
<td>80-89</td>
<td>5</td>
</tr>
<tr>
<td>90-100</td>
<td>0</td>
</tr>
<tr>
<td>100-120</td>
<td>0</td>
</tr>
</tbody>
</table>
4.2.2 GRAPHICAL PRESENTATION ON TEST RESULTS BASED ON LECTURE METHOD

Figure 8. Lecture method

The results indicated that 8 pupils failed to get a pass mark, 35 pupils are in the range 50-59 percent. The marks most pupils got are no very pleasing and not motivating. This shows that the lecture method cannot motivate pupils to pass at the end of the course.

4.12 RESULTS BASED ON PUPIL CENTERED METHODS

Table 5. Pupil centered method

<table>
<thead>
<tr>
<th>Mark Range</th>
<th>Number of Pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-49</td>
<td>3</td>
</tr>
<tr>
<td>50-59</td>
<td>14</td>
</tr>
<tr>
<td>60-69</td>
<td>19</td>
</tr>
<tr>
<td>70-79</td>
<td>8</td>
</tr>
<tr>
<td>80-89</td>
<td>5</td>
</tr>
<tr>
<td>90-100</td>
<td>2</td>
</tr>
</tbody>
</table>
GRAPHICAL PRESENTATION ON TEST RESULTS BASED ON PUPIL CENTRED METHOD

Figure 9. Pupil Centred Method

4.13 ANALYSIS AND INTERPRETATION
The table and the graph show that pupils at Kuwadzana 1 High School understood better when using pupils centred approach methodologies. The pass marks improved and only three pupils failed. This showed that pupil centred teaching methods are effective in leaning Mathematics at ‘A’ Level.

4.14 CONCLUSION
The findings of the research were presented and analysed in this chapter. The researcher used tables, pie charts, bar graphs and descriptive presentation. Therefore the researcher suggests that teaching methodologies should shift from teacher centred to pupil centred, use of instructional media, effective use of motivational techniques and availability of resources will probably help to improve pupil’s performance.
CHAPTER FIVE

Summary, Conclusions And Recommendations

5.1 Introduction
The chapter summarises the main outcomes of the whole study; give conclusions and necessary recommendations on how best the problems faced by pupils in learning of Mathematics can be addressed to improve pupil’s performance.

5.2 SUMMARY
The research project was about assessing the impact of e-tivities in the learning of Mathematics by form 6 pupils at Kuwadzana 1 High School in Warren Park District.

Chapter one of this project focused on the background of the study, on what prompted the researcher to carry out the research project. Other aspects that were looked at in this chapter include the statement of the problem, assumptions, research objectives, justification of the study, delimitations, limitations ad definition of terms.

In chapter 2 of the project the researcher consulted other authorities and valuable insights were gained from the literature review on issues like attitude towards the subject, motivation teaching methodologies, that is, on both the teacher centred and learner centred methodologies, and the effects of inadequate resources such as Mathematics textbooks and internet to research and share statistical concepts in the learning of Mathematics. These authorities reviewed some advantages and disadvantages of these aspects.

The researcher made a thorough scrutiny on the research methods which were used for this project. These included the research design, research instruments basing on their merits and demerits. These data collection instruments include questionnaires, interviews, observations and tests. The tests and questionnaires were given to the pupils; the interview targeted the Mathematics teacher at Kuwadzana 1 High School. Observation targeted the class taught by the researcher as well as the classes that were taught by the researcher’s mentor during teaching practice.
Data presentation, analysis and interpretation were done on chapter 4. This was done in an
demand to answer the objectives and assess the assumptions. Tables, bar graphs, pie charts
and descriptive presentations were used to present data. The researcher also looked at the
summary of chapters, conclusions and recommendations to the problem identified in the school.

5.3 CONCLUSION
The results obtained from the research reveal that many pupils in upper six Mathematics class
had difficulties in the learning process of the subject without e-tivity tools. This was attributed to
the negative attitude that the pupils had towards the Mathematics tools used which made them to
dislike the subject. Lack of motivation made the pupils to lose the zeal and eagerness of the
study of this subject. Teacher centred methodologies made the pupils to be passive learner
which even affected their concentration span during lessons delivery. Adequate resources like
interactive boards, google groups also were another contributing factor that can be accredited to
the betterment of the learning process of Mathematics. Literature review and research findings
through various data collection instruments were also of great value in the research process.

5.4 RECOMMENDATIONS
The research clearly shows that pupils had difficulties in the learning of Mathematics using the
traditional methods. The researcher then made the following recommendations basing on the
findings of the study.

- Teachers, school administration and parents should motivate pupils through
  encouraging remarks, providing required e-tivities resources so that pupils
  develop a positive attitude in Mathematics.
- The teachers should revise their teaching methodologies and try to drift from
  teacher centred methodologies such as the lecture method to learner centred
  methodologies so as to make them active participants in the learning process
  which will improve their performance.
- Schools should expose the upper six class to a career’s guidance and counselling
  sessions before making them choose subjects.
- Educationalists and Curriculum designers should put more emphasis on use of e-
  tivities in the learning of Mathematics.
Educationalists and curriculum designers or developers should take up this study/researcher as a foundation for further research pertaining to use of e-tivities in the learning Mathematics related problems.
References


APPENDICES

Table 6-E-tivity tools

<table>
<thead>
<tr>
<th>E-tivity tool</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive board</td>
<td>15</td>
</tr>
<tr>
<td>Projector</td>
<td>10</td>
</tr>
<tr>
<td>Google group</td>
<td>10</td>
</tr>
<tr>
<td>WhatsApp group</td>
<td>13</td>
</tr>
<tr>
<td>Lecture method</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 7. Response on E-tivity

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Number of response</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you feel when you are doing Maths with E-tivities</td>
<td>BORED</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>CHALLENGED</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>INTRESTED</td>
<td>32</td>
</tr>
</tbody>
</table>
### Table 8. E-tivities resources

<table>
<thead>
<tr>
<th>RESOURCES</th>
<th>TOTAL NUMBER OF RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart board</td>
<td>6</td>
</tr>
<tr>
<td>Textbooks</td>
<td>20</td>
</tr>
<tr>
<td>Computers</td>
<td>40</td>
</tr>
<tr>
<td>Internet resources (computers)</td>
<td>4</td>
</tr>
</tbody>
</table>

### Table 9- Results on the lecture method

<table>
<thead>
<tr>
<th>Mark Range</th>
<th>Number of Pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-49</td>
<td>8</td>
</tr>
<tr>
<td>50-59</td>
<td>35</td>
</tr>
<tr>
<td>60-69</td>
<td>2</td>
</tr>
<tr>
<td>70-79</td>
<td>1</td>
</tr>
<tr>
<td>80-89</td>
<td>5</td>
</tr>
<tr>
<td>90-100</td>
<td>0</td>
</tr>
<tr>
<td>100-120</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 10. Pupil centered method

<table>
<thead>
<tr>
<th>Mark Range</th>
<th>Number of Pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-49</td>
<td>3</td>
</tr>
<tr>
<td>50-59</td>
<td>14</td>
</tr>
<tr>
<td>60-69</td>
<td>19</td>
</tr>
<tr>
<td>70-79</td>
<td>8</td>
</tr>
<tr>
<td>80-89</td>
<td>5</td>
</tr>
<tr>
<td>90-100</td>
<td>2</td>
</tr>
</tbody>
</table>