

MIDLANDS STATE UNIVERSITY



FACULTY OF EDUCATION

DEPARTMENT OF EDUCATIONAL TECHNOLOGY

**METHODS OF USING ICT TOOLS IN THE TEACHING OF MATHEMATICS AT
JUNIOR LEVEL IN MAKONI DISTRICT PRIMARY SCHOOLS.**

BY

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APPROVAL FORM

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The undersigned certify that they have read and recommended to the Midlands State University for acceptance a research project titled:

AN INVESTIGATION ON METHODS OF USING ICT TOOLS IN THE TEACHING OF MATHEMATICS AT PRIMARY JUNIOR LEVEL IN MAKONI SOUTH CIRCUIT PRIMARY SCHOOLS

In partial fulfilment of the requirements of the Bachelor of Education Degree in Computer Science.

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ABSTRACT

The primary objective of this study was to find out methods of using ICT tools in the teaching of Mathematics at junior level in primary schools. Specifically, the study sought to gain an appreciation of the extent to which teachers use different ICT tools in the teaching and learning processes in Mathematics at junior level in primary schools. A descriptive survey approach was used to collect the data on methods of using ICT tools. The study used questionnaires and interviews as research instruments. Questionnaires were completed by twelve teachers, five males and seven females. Interviews were conducted with four heads of schools, three males and one female. Convenient sampling techniques were used to select the sample. The study revealed that many teachers use the drill and practice method in teaching Mathematics using ICT tools like computers, laptops, as well as white boards. From the study it also emerged that school leaders should work to source the ICT resources needed like overhead projectors and tablets. From the study it can be concluded that some policies like assessment policies need to be reviewed to cater for the use of ICT tools. In addition to the reviewing of assessment policies, it was also concluded that there is need for all stakeholders to be actively involved in the acquisition of various ICT tool. The findings of the study recommends that the Ministry Of Primary and Secondary Education and schools should provide in-service training for teachers so that they keep abreast of new developments in software and ICT tools used in teaching.

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DEDICATION

I would like to dedicate this project to my beloved wife, Melody and our two daughters Nenyasha Trish and Neruvimbo Trinity for their love and support throughout this course.

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CHAPTER 1: THE PROBLEM AND ITS CONTEXT

1.1 INTRODUCTION

This chapter covers the background of the study which serves to reveal and justify the need to carry out the study. The chapter also includes the statement of the problem, objectives and research questions, significance of the study, delimitations of the study, limitations and assumptions as well as definition of terms and abbreviations. The chapter ends with a summary of the chapter.

1.2 Background to the study

Information Communication Technologies is a term which is used to refer to technologies which are being used for collecting, storing, editing and passing of information in various forms. This is a vital element in today's world. It has been used in various countries in a number of sectors as a tool for administration management, curriculum and for teaching and learning. According to Horn (2013) most developed countries like America and Britain ICT has been integrated successfully in the teaching and learning process. Most of these countries have official policies on the use of ICT to improve the quality of education. In Canada for example, these policies are implemented through concerted plans and actions at the school level, involving school leaders, administrators and teachers. Vanderlinde and van Braak (2011) suggest that an essential condition for ICT implementation's success is good communication among educational policy officials, schools and teachers.

At present ICT is considered as an important means to promote new methods of instruction in teaching and learning. Alexander (1992) suggests that, in the UK, focus has been more on content rather than pedagogy. He further argues that content and pedagogy are linked. In order to explore the best methods to use ICT tools there should be a look at the content to be taught. Rao (2004) purports that a choice of method of using ICT is further dependant on the teacher's knowledge of the subject matter. It is essential that teachers must have basic ICT skills and competencies. It is for the teacher to determine how ICT tools can best be used in the context of culture, needs and economic conditions.

Rao (2004) further views good teaching as not simply adding technology to the existing teaching and content domain rather it should cause the representation of new concepts and requires developing sensitivity to the dynamic, transactional relationship between the three components of knowledge:

Content—Technology--Pedagogy.

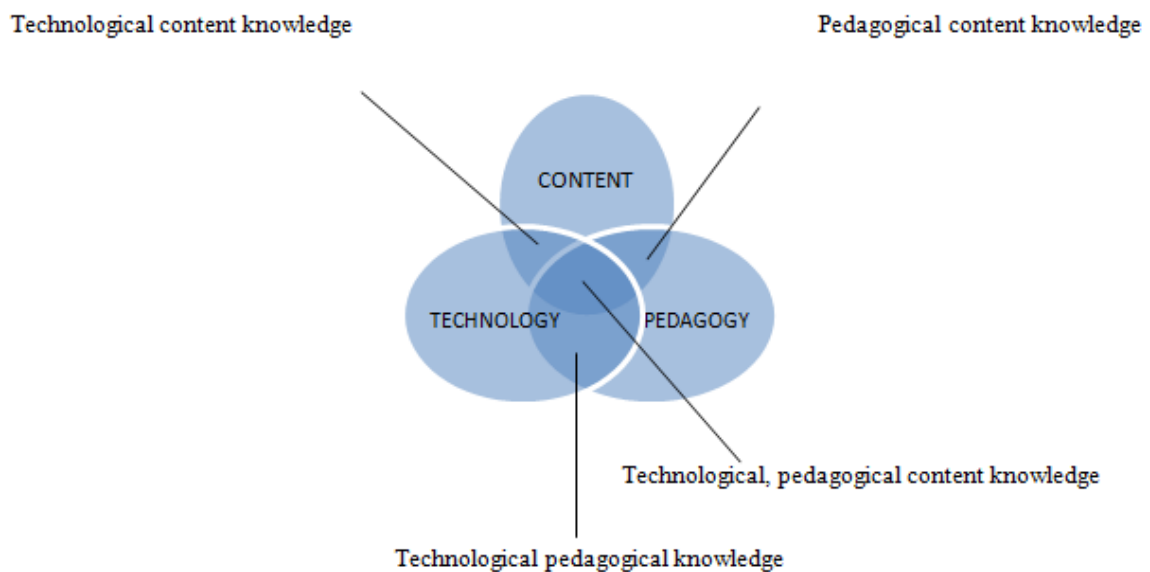


Fig 1.2.1 showing the relationship of technology, pedagogy and content. Fathima (2013)

The method which the teacher therefore decides to use is dependent on the above relationship. Voogt, (2003) has also seen that ICT tools should be used to develop students' skills for communication, problem solving and lifelong learning. Cuban (2001) purports that although computers and technology are prevalent throughout our societies, developing countries like Bangladesh, Kenya and Zimbabwe are far from reaping their benefits because of certain barriers like pedagogical, psychological and cognitive. To be successful in the use of information technology, it may be a vital precondition for improving the utilization of computers and other technological aids in the educational process. Research suggests the importance of focusing on pedagogy rather than on technology itself and on the need to innovate teaching styles when building competences in ICT in education.

Just after Zimbabwe obtained independence in 1980, the country had one of the best education systems in the southern African region. During these years, the government worked on expanding education access by constructing more schools in rural areas and disadvantaged urban centres, improving the training of teachers, and providing educational materials to schools. This was done as a way of meeting some of the world's best educational standards. According to the World Economic Forum's Global Information Technology Report, Zimbabwe ranked 105th out of 115 economies in 2005-2006, based on a networked readiness index, which measures the degree of preparation of a nation to participate in and benefit from ICT developments.

The government came up with policies to adopt the use of ICTs in the education sector just like in any other government sectors. According to Isaacs (2007) the Zimbabwean government adopted a national ICT policy in 2005 that was informed both by a Harvard University-guided e-readiness survey, which suggested the country was not uniformly e-ready, and by a host of preceding general and sectorial policies including Vision 2020, the national science and technology policy adopted in 2002, and the Nziramasanga Education Commission Report which in 1999 recommended the promotion of the educational use of computers for teaching and learning in educational institutions.

The policy's vision is to transform Zimbabwe into a knowledge-based society by 2020, while its mission is to accelerate the development and application of ICTs in support of economic growth and development. The government through the help and incorporation of non-governmental organisations came up with various initiatives like AVU, African Virtual University. This programme aimed at the teaching of Mathematics and Science with the incorporation of ICT tools. Isaacs (2007), further says that the intention is to contribute to the growth of more and better quality teachers through the use of flexible, open, distance, and e-learning (ODEL) methodologies at an affordable cost for diploma, undergraduate, and graduate levels.

Another government and NGO initiative was CITEP which was a local capacity-building project supported by the Flemish Office for Development Co-operation and Technical Assistance (VVOB) in Zimbabwean colleges. The objective was on developing capacity to maintain and manage ICT equipment and strategies for effective use of ICTs in the colleges.

The project focused on the clear ICT policies to be in place in colleges and to promote technical and professional skills of college ICT unit staff. World Links Zimbabwe was another initiative which was part of the international network of World Links organisations and has historically been a pioneer in the promotion of education through ICTs. The organisation has been active in Zimbabwe since mid-1999 when some ICT centres were established with the support of the World Bank and in partnership with the Ministry of Education Sport and Culture. The World Links centres were established near schools so that they could service both the schools and the local community.

These have been efforts by the government to make ICT tools become a reality in the Zimbabwean education context. Some of these efforts were focusing on the general education system at higher levels like at teacher training colleges and universities. In line with this, professional development may need to be local and context-based on specific subjects. Rather than having policies which call for the integration of ICT tools in teaching-learning process, there is need for policies which are subject based so that benefits are realised. Mumtaz (2002) argues that good teaching is not simply adding technology to the content that already exists, but should cause the representation of new concepts in a way which is beneficial to both the teacher and the learner and the teaching as a whole. This has to be done in a way that maintains the positive relationship of the content to be covered, the technology to be used as well as the pedagogy.

At primary schools where learners are still young and need concrete objects so as to grasp some aspects, the task lies in the hands of the teacher to adopt the best methods possible to make teaching and learning more interesting. Teachers and learners regard some subjects like Mathematics as difficult areas to teach as well as learn. This leads to the need to come up with methods of teaching that are interesting and motivating to both teachers and learners. The use of technology in teaching Mathematics is one of the ways that makes the teaching and learning process interesting. However the best approaches or methods only as well as the right tools need consideration. It is against this background that the researcher would like to carry out an investigation on the methods of using ICT tools in the teaching of Mathematics at junior level in Makoni District

1.3 Statement of the problem

A number of ICT tools are used in the teaching and learning process for the different subjects across the curriculum. The aim of using these tools is to achieve the best learning experiences for the learners as well as for the teacher. Effective use of ICT tools depends on the methods chosen in the teaching and learning situation. It is the intention of the researcher to carry out an investigation into the methods of using ICT tools in the teaching and learning of mathematics at junior level in Makoni South circuit in Makoni district in Manicaland Province

1.4 Research questions

1.4.1. What methods are used by teachers in the teaching of Mathematics using ICT at junior level?

1.4.2. What support systems do teachers require for them to be able to use these methods?

1.5 Significance of the study

ICT in the world of today is essential in all sectors of economy including education. Its use in the teaching and learning of subjects like Mathematics is important. It is hoped that the results of this study will help the researcher in his future episodes of teaching using ICT tools as well as other primary school teachers, so as to change and improve their methods of using ICT tools in teaching the various subjects at primary school.

The teachers within the district will also benefit from the results of this study in a number of ways. Workshops may be organized at cluster or district levels to disseminate the information obtained from this study. This will therefore help them improve their teaching methods and in a way the whole district's performance may improve due to the use of such methods. Assessment methods may also be modelled along the line of ICT tools. Jere (2000) recommends the training of classroom teachers in how to assess students and believes this training would improve the quality of education.

The learners will benefit from the results of this study through the use of interesting and motivating methods of learning.

Thus if teachers make use of various teaching methods using ICT tools when teaching Mathematics, then the learners may become motivated and more interested in learning as well as improve their understanding of the content that will be taught.

Stakeholders like parents and other well-wishers are likely to benefit as well from the results of this study. After being enlightened on the methods of using ICT tools in the teaching and learning of Mathematics, perhaps they will make efforts to improve the availability of various ICT tools in schools. The government as a whole will use the results of the research when designing the curriculum to incorporate the use of ICT tools. This may also impact on the designing of the assessment as well so that assessment goes hand in hand with the methods of using the various ICT tools.

1.6 Limitations of the study

The researcher faced a number of constraints while carrying out this study. These included:

1.6.1 Methodological limitations

In carrying out this study, the researcher will use a sample of the schools in the district. Various schools have various environments. The results of the study may not fit very well in certain school environments which will make it difficult since the researcher cannot involve all the schools in the district because of the research design method which calls for the use of a sample only.

1.6.2 Time constraint.

This is because the researcher was at work most of the time, that is, from 7a.m to 4p.m every day as it is a government requirement. Having time to visit schools to gather information was a challenge thereby compromising the validity and reliability of the research results. However, through the permission of the school administration time and again the schools were visited. The researcher also took advantage of heads meeting at cluster level to address related issues with the schools of the selected schools.

1.6.3 Financial constraints.

There was a need to visit a number of places to get permission as well as information so this meant money for transport was needed and this was a challenge. The researcher also met some expenses on typing, printing as well as photocopying of documents like questionnaires and interview guides. The researcher asked for permission to use the school's printing machine to reduce the expenses. To reduce transport costs the researcher made use of cluster heads' meeting to distribute and collect questionnaires. This helped to improve the validity and reliability of the research.

1.7 Delimitations of the study

The study focused on methods of using ICT tools in the teaching and learning of Mathematics at junior level in primary schools of Makoni District. The study was confined to four primary schools in Makoni South of Makoni District in Manicaland Province.

1.8 Definition of terms

Computer – a machine that automatically accepts stores and processes data to produce information

Heo (2004) defines a computer as a programmable usually electronic device that can store, retrieve and process data. The English Oxford living dictionary online defines a computer as an electronic device for storing and processing data, typically in binary form according to instructions given to it in a variable program.

Factors -anything that has an impact on how something is done

Information Communication Technology- an umbrella term used to refer to various software and hardware components which include computers, projectors, internet, video and digital cameras which can assist in the modern teaching and learning practices

Methods-how something is done using certain tools or equipment

1.9 Summary

This chapter has given the setting and orientation of the research. It outlined the background of the study which looked at the current educational system as well as the gaps as far as the use of ICT tools in the teaching of Mathematics at junior level is concerned, statement of the problem, research questions which the study hopes to answer were outlined and significance of the study which brought out the importance for carrying out the investigation was outlined. The chapter also looked at delimitations of the study, limitations of the study that include time and financial constraints were looked at. Definition of terms to be used in the study were given. The last part of the chapter looked at the summary of the whole chapter. The next chapter shall focus on the review of related literature.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter presents literature on the methods of using ICT tools in the teaching-learning of Mathematics at junior level. It focuses on the methods of using ICT tools as and on support systems necessary on using ICT tools in the teaching and learning of Mathematics at junior level.

2.1 Methods of using ICT tools in teaching of Mathematics

A number of methods of using ICT tools in the teaching and learning of Mathematics at junior primary level can be employed depending on a number of factors. The content to be taught the skills of the teacher as well as learners' perceptions may need to be considered. McLoughlin and Oliver (1999) define methodical roles for teachers in a technology-supported classroom as including setting joint tasks, rotating roles, promoting student self-management, supporting meta-cognition, fostering multiple perspectives and scaffolding learning. Some of the methods used to incorporate ICT tools in the teaching of Mathematics may depend on the teacher's view of the subject matter and the teacher's beliefs about the learners. This is supported by Hadjidemetriou and Williams (2001) who propose a methodology that will help to bridge the gap between pupils' difficulties and teachers' perceptions of these difficulties.

2.1.2 Reciprocal teaching method

This is a method of teaching which can be used when teaching Mathematics at junior primary level using ICT tools. The teacher can use a reciprocal teaching method using computer-assisted instruction (CAI) where learners may be engaged in learning a particular skill. Software can be made or used which links what pupils already know and what they do not know. In other words the gap can be bridged using appropriate software. Afshari, Bakar, Su Luan, Samah, & Fooi (2009) conclude that students who use computers when learning are more engaged and motivated and produce work that is of greater length and higher quality.

In this reciprocal teaching method, learners may take turns to teach or provide information to the others in those areas which they have mastered. Heo (2004) says it may be used to assess learning goals and with digital tools, it is even easier to share, revise, and critique stories and learn from one another. This method is also known as peer teaching. The teacher's role in peer teaching or reciprocal teaching may be that of collecting and providing the computer tools for the group of learners or individual learner depending on the approach the teacher chooses.

2.1.3 Drill and practice

Jackson and Kutnick (1996) propose that individuals perform better than groups when carrying out drill and practice activities. ICT is a powerful tool of presenting or representing information in different ways. This method of drill and practice helps to make pupils learn better by repetitive processes. This can be through different forms like text and pictures or tables and graphs or by enabling changes to be shown dynamically such as in mathematical modelling. Cobb and McClain (2002) have observed that computer tools can help students or teachers manipulate complex data-sets. This then provides a context for effective discussion which in turn can help to develop mathematical understanding. This method can make use of tools like the projector and PowerPoint presentations. Learners get a step by step demonstration of carrying out a mathematical operation and they also practise step by step until they master.

2.1.4 Digital story-telling

ICT tools may be used in the learning of Mathematical language. In this approach students create their own digital stories using text, images, sound and their recorded voices for language learning. Cobb and McClain (2002) define digital storytelling as a form of multimedia that comprises images and segments of video with background music and a voice-over narrative. Story telling is a method which is very effective in teaching of some Mathematical concepts to learners of different age groups. Armstrong (2003) views digital storytelling as simply the application of technology to the "ancient" experience of sharing personal narratives. Technology that students currently have access to, provides them with opportunities to communicate in ways that were not possible in the past. With technology,

learners working on digital storytelling can articulate their views creatively in the form of images, video, or sound, and can share their stories with the rest of the world.

This method makes learning of Mathematics livelier because it gives room for learners to include their own personal experience as they will be learning Mathematics concepts.

2.1.5 Flipped classroom

The flipped classroom is another method of blended learning in which students learn online at least part of the time while attending the conventional school (Horn, 2013). According to Lim (2002), the rationale for this method is to allow students to spend time working through their sums or questions on their own, with teachers later assisting those who need more help. The content is taught through digital means, through the use of teacher-created videos or other media, prior to face-to-face class time. Time is then set aside for the teacher to provide more help to those learners or groups that have difficulties and need more help. The teacher is the one who has the duty of creating the videos which are then accessed by the learners at their own time prior to the face-to face class time.

Horn (2013) says that in the flipped classroom students view lessons and lectures online before class, and their later time in the classroom, previously reserved for teacher instruction, is left for teacher assistance as needed. This approach gives learners an opportunity to learn the Mathematical concepts in advance before face-to-face learning with the teacher. Learners also have the chance to take a look backwards at areas already covered since the videos accessed are stored for use later or reference.

2.1.6 Use of blogs and open source software applications

With the wide use of the internet and broadband networks, use of software applications can also be incorporated as another approach to the teaching of Mathematics in primary schools. Anderson (2006) says that even in schools where technical expertise is not available, the commercially available learning management systems often have functions and features of online software applications. Teachers can use blogs in their lessons, not only for information dissemination and online collaboration, but also as an online platform that can link to other

online software applications for example, links to online videos, games, etc. In other words, the blog site can be the gateway to other online applications.

The blogs can also be used as a platform for students to hold online discussions. The other applications like online games can be used to reinforce skills and concepts learnt previously.

2.2 Support systems for use of ICT tools in teaching of Mathematics at primary junior level

The introduction of innovations and new technologies into any learning situation requires careful planning and a good deal of developmental testing. This process often requires multidisciplinary approaches involving teachers, researchers, technologists, developers, and students (Glover and Miller 2001). Amongst them, teachers are pivotal in creating ICT-mediated learning environments (Lim, 2002). There are necessary and sufficient conditions to adequately support ICT for teaching and learning Mathematics in primary junior level in schools.

2.2.1 Policy and leadership

Tay (2011) suggests that policy and school leadership play an important role in the integration of ICT in the classroom. Both school and national policies are needed to ensure the effective implementation of ICT tools in classrooms. The national education policies should give enough room for the use of the various methods of using ICT tools. This should also cascade down to the schools' policies that give the opportunity for this use. According to Tondeur, van Keer, van Braak & Valeke (2008), the school leaders should initiate such plans as well as address some obstacles that can be encountered in the various methods of using the ICT tools. There has to be an element of togetherness between the teachers and the leaders on use of ICT tools in teaching Mathematics at junior level.

2.2.2 Infrastructure

Some vital issues are the buildings and infrastructure. Lim (2002), argues that the physical structures at a school should provide opportunities for the use of ICT tools in the teaching of Mathematics. Technological infrastructure is another aspect which has a bearing on the effective use of ICT tools in the teaching and learning of Mathematics at junior level. The

effective use of ICT would require the availability of equipment, supplies of computers and their proper maintenance including other accessories.

Successful use of ICT tools requires other resources, such as printers, multimedia projectors, scanners, which are not easily accessible to all primary schools. In addition to this ICT tools require up-to-date hardware and software. Gulbahar (2007) argues that using up-to-date hardware and software resources is a key feature in the diffusion of technology but a rare experience in educational institutions. High-speed internet is another aspect required to be in use in order for learners to access blogs and other online tools. As Owston (1997) writes, the Internet is a truly open technology, allowing users with any hardware and software to derive the necessary information from the network, independent from the location of data and knowledge bases. The internet is a basic requirement. Barron and Orwig (1995) also argue that the Internet is a large source of reference materials and data required for all types of educational activities. Therefore it is of paramount importance in infrastructural development to make sure that the internet is available.

2.2.3 Professional development for teachers

To enable teachers to be both pedagogically and technically competent to contribute to and facilitate methods of teaching and learning with ICT tools, professional development is needed. A change of attitude by some teachers who also regard ICT tools as low importance or insignificant, may be facilitated. Prestridge (2010) views professional development as an inevitable requirement for the implementation of ICT related teaching methods. Some teachers may also need to be enlightened on ways of using some tools like the internet to search for the relevant materials. Yang & Moore (1996), have seen that for teachers, administrators and, specifically, for learners the biggest barrier in obtaining data of any type on the internet is the navigation problem residing in the lack of functionality of tools and systems for systematic description and cataloguing of resources on the internet. Thus, according to Clemmit (1996), she had had to spend almost a year before she managed to find the sites with information, which could be used in the teaching of physical geography.

This actually points to the need for training and development of teachers which can take place through workshops and conferences, online platforms as well as internal and external

sharing discussions on the various methods of using ICT tools in teaching Mathematics. In addition, the schools can launch practitioner research, where teachers become researchers so as to systematically reflect, learn, improve, and share their practices as far as the use of these methods are concerned.

2.2.4 Curriculum and Assessment

ICT integration requires modifications in the curriculum and assessment methods. It is important for the implementation at the school level to be consistent with the national ICT policy and curriculum as viewed by Tondeur et al (2007). A direct implication of this is that curriculum reform should take into consideration teachers' personal perspectives and teaching practices so that they are in line with each other. It is important for both school based assessment and national assessment to be in support of each other. Therefore it calls for the methods that are considered in assessment practices.

2.2.5 Partnership and Engagement

Partnership with and engagement of significant and relevant stakeholders are also essential for the use of ICT tools for teaching and learning in schools. No man is an island; similarly, no school is an island. Engaging parents and getting their support in the use and purchase of computing equipment for children also greatly facilitates the use of ICT tools in the classroom. This also provides room for the expectations from the community to be integrated in the curriculum. This partnership can further include even the industry which may help provide funds for the purchase of and provision of ICT tools to be used in the teaching learning situation.

In this regard Mumtaz (2000) states that software designers and teachers should work together and observe critically how a range of teachers teach in the classroom and how appropriate forms of software supporting different skills and ways of teaching and learning can be better developed. In the same way parents or the community should also know how these various tools can be used since they are the ones who may help learners with homework. For instance some parents were used to writing on wooden boards with a piece of charcoal but with the advent of technology there are now tools like notebooks and interactive

whiteboards. Parents or guardians should be aware of how these tools are used if ever they are to help their children meaningfully in the learning of Mathematics.

2.3 Summary

A number of issues have been raised in this chapter on what some authorities say regarding the use of ICT tools in the teaching of Mathematics at junior level. Some of the issues include the roles of the teacher, the nature of the content to be taught as well as the support systems needed for successful use of ICT tools. Various authorities have different observations on the use of ICT tools in the teaching of Mathematics. The next chapter focuses on the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology that will be used to carry out the study. It will explain why the descriptive survey design is used in an investigation on methods of using ICT tools in the teaching and learning of Mathematics at junior level in Makoni South District. The chapter further presents the questionnaire and interview as research instruments which were used to collect data. Sampling procedures and data analysis plan will also be discussed as well.

3.2 Research design

In carrying out this research the researcher used the mixed method approach. The design was the descriptive survey which Cohen and Manion (1994) regard as being perhaps the most used in educational research. Best and Kahn (1993) acknowledge this when they say that descriptive studies have greatly increased what happens in schools because they produce statistical information about aspects of education that interest educators and policy makers. The design was used to collect information concerning the methods of using ICT tools in the teaching-learning of Mathematics in primary schools at junior level.

A research design is viewed by Mohsin (1984) as a plan that enables one to reason from observed facts and events to logically sound conclusions. Huysamen (1996) defines a research design as a preconceived plan according to which data are to be collected and analysed to investigate a research problem. According to Borg and Gall (1989), a research design is all procedures selected by a researcher for studying a particular set of questions. From the definitions above a research design can be seen as an overall plan or compiling of various components of the research study.

The design involves identifying the population and coming up with a representative sample of the population. Chikoko and Mhloyi (1995) purport that when using a descriptive survey design we select a small group or sample of people called respondents. A respondent is a person who provides data for analysis by responding to survey questions. It is from the sample that relevant information was collected.

To bring valid results in descriptive survey, the sample must be representative of the population. Since the population for this research was large the descriptive survey made it possible to use a small sample and generalize the results. For the purpose of this study, the survey design rested on the fact that if surveys are to be conducted correctly, information collected from a small sample can be used to generalize the whole population. Ray and Mondal (1999) say that the major strength of a survey research is its wide scope in that detailed information that can be obtained from a sample of a large population.

Descriptive survey was chosen in this research because of its nature of qualitative inquiry. It implies that whatever is observed at one time is normal and under the same conditions would be observed at any other time in future. However, the descriptive survey design has got its own limitations. Ray and Mondal (1999) state that the survey designs require a good deal of knowledge on the part of the researcher so that the researcher knows what is expected and what is not expected in coming up with the solutions to the problem under study. In a survey design there are chances that respondents may give artificial or inaccurate information. This led the researcher to use some techniques that include dehoaxing so as to get accurate information.

3.3 Population and sample

In this study the population comprised of primary school teachers and heads of schools of Makoni South Circuit of Makoni District which has thirty-five schools and two hundred and seventy teachers. According to Chisnall (1997) a population refers to a group of people or objects which are similar in one or more ways and which form the subject of the study in a particular survey.

The sample drawn from the population had sixteen respondents who comprised twelve teachers, five males and seven females, and then four heads of schools. Tuckman (1994) defines a sample as a subset of the whole population which the researcher works on and conclusions are to be drawn. The subset should display all the characteristics of the population.

3.3 Sampling Procedure

From the population the researcher used convenient sampling to select the four primary schools. The four schools were chosen because of their nearness to the researcher's place of residence. Random sampling technique was used to select the three teachers from each school. The random sampling technique was used because each member had an equal chance of being selected (Crawshaw and Chambers,1994).

3.5 Research instruments

These are techniques that are employed to collect the necessary information from the chosen respondents. The researcher used questionnaires and interviews to solicit information to answer research questions on methods of using ICT tools in the teaching of Mathematics at Primary schools in Makoni District. The researcher designed the instruments with the guidance of research questions outlined in chapter one. Each of the research instruments has its own advantages and disadvantages.

3.5.1 Questionnaire

The researcher constructed questionnaires for the teachers and the aim was to find their views on methods of using ICT tools in the teaching of Mathematics. Chikoko and Mhloyi (1995) describe a questionnaire as a document containing questions designed to solicit information appropriate for analysis. The questionnaire contained seven items which consisted of two selected responses (closed items) and five open ended items. The reason why the researcher used questionnaires is that: firstly, questionnaires are common instruments for data collection.

Leedy (1980) acknowledges this when he says that, it is common place instrument for observing data beyond the physical reach of the observer. This means in the physical absence of the researcher, the questionnaire will represent him. More so, the researcher used the questionnaire method as it can be used to collect large quantities of data from large numbers of respondents. Considering the number of respondents, the researcher was not able to

interview all of them because of limited time hence questionnaires were used to collect data for the purposes of this study. Thirdly, questionnaire allows for a quick collection of data in a short space of time.

On top of this, the respondents needed to respond at their own pace and the use of questionnaire allows for this. Although the questionnaire is seen as useful and effective in this study, it has its own demerits if not handled properly.

Some drawbacks of questionnaires are that once the questionnaire have been distributed, it is not possible for the questions to be edited or changed. Questionnaires do not give room for probing or to appraise the non-verbal behaviour of respondents that is they do not review the true opinions, attitudes and feelings of the respondents. The other drawback of questionnaire is that it does not guarantee that the intended respondent is really the one who responds since this is done away from the researcher. There are also chances that some of these questionnaires may not be responded to as early as the researcher intends them to be responded to.

Looking at the above drawbacks, the researcher has the task to ensure validity of the questionnaires. Cresswell (2003) says validity is the degree to which one can draw meaningful and useful inferences from the scores on the instruments. The researcher got the assistance on how to construct good questionnaires that ensured validity from his Project Supervisor.

3.5.2 Face to face

The researcher used the interview guide whereby the interviewer (researcher) had a set of questions which were read to the interviewees (heads of schools) one by one. McMillan and Schumacher (1993) define an interview as an oral presentation of a set of questions that are prepared in advance. There were two interview questions based on the research questions as well as probing questions for the heads of schools. The interview method will be used because it has a high response rate. The information that is obtained through direct verbal interaction between the interviewer and interviewee where the responds are prompt is the main advantage of interviews. The way in which a response is made, the tone of voice, facial

expression and hesitation can provide information that other instruments like questionnaires cannot do.

In this case heads of schools were free to express themselves. This gives the researcher a better understanding of the respondents' opinions. Interview method provides a desirable combination of objective and depth which often permits gathering of valuable data. Although the interview method is effective in obtaining reliable data it has its disadvantages that need to be controlled.

According to Borg and Gall (1989), some respondents may try to please the interviewer, which may result in obtaining biased data. Some respondents may also divert to other issues which may be out of context hence the need to keep on checking their responses and the questions asked to find their relationship. The interviewer (researcher) will also need to be considerate of the time of the interview because there are some times when heads are very busy with their work thereby leading to a rushed process. It may be difficult to schedule the interview date and time in a way that suits both the interviewee and interviewer.

To ensure reliability of the instruments to be used, the researcher carried out a pilot test at his work place among fellow workmates. The researcher asked five colleagues to complete the questionnaire and the others were interviewed using the interview guide. This was done in order to assess whether the questions are appropriate before they were administered to the respondents in the sample.

3.6 Data collection procedure

In this study the researcher used research instruments like questionnaires and interviews. The questionnaires were administered to the twelve teachers. Interview guides were used in carrying out interviews with heads of schools. Descriptive survey promotes triangulation of research instruments. In this sense a number of instruments are used at the same time to collect information which will then be collated together. This is supported by Best and Kahn (1993) who says that triangulation gives a more detailed and balanced picture of the situation. In this study the researcher used information obtained from questionnaires and interviews from the heads of schools to triangulate ideas on methods of using of ICT tools in the teaching learning of Mathematics at junior level.

The researcher sought permission to go to the head office. After getting permission from the head office he got permission from the provincial office. The researcher then went to the district office. Afterwards he got permission from all the offices concerned he then went to the schools to collect data on methods of using ICT tools in the teaching-learning of Mathematics. The researcher used the letter from the district offices to seek for permission from the school heads to carry out the study in their schools.

The researcher explained the purpose of the study and assured the school heads that information obtained would be used for academic purposes only. This was necessary to get free cooperation of the respondents. The researcher was introduced to teachers in the schools. The researcher explained to the heads of schools what the research was all about before interviewing them. After this, the researcher interviewed the interviewees and recorded their responses on his mobile phone. The researcher then distributed the questionnaires himself to the teachers in the sample at the schools on the day that he was carrying out the interview with the school heads. This helped to ensure that the distribution process has no loopholes and a thorough follow-up was made by revisiting the schools to make sure they were returned within the intended time frame.

3.7 Data presentation and analysis procedure.

The researcher will present the collected data in form of tables. The tables will be made to indicate frequency of each response on the scale. The raw frequencies will be converted to percentage frequencies. After constructing tables the data will be analysed, discussed and conclusions in relation to methods of using ICT tools in teaching-learning of Mathematics will be drawn. The researcher will compare the information of the respondents that is from teachers and heads of schools. This is called triangulation of ideas that is comparing the same ideas from two sources or instruments.

3.8 Summary

This chapter looked at the research design that was used in the study, and the descriptive survey design was used. Research instruments used were the questionnaires and interviews. The researcher used convenient sampling to select the four schools and the twelve teachers as

well as four heads of the four schools. Data collection and data analysis procedures were also discussed. The next chapter deals with data presentation, analysis and discussion.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

1.1 Introduction

This chapter focuses on the presentation of the research findings on methods of using ICT tools in the teaching and learning of Mathematics at primary level. The researcher presents the responses to items in the questionnaire in form of tables and also verbatim. The data was obtained from the questionnaires and interviews. The responses of participants were from junior teachers and heads of schools. In data analysis percentages and number of responses are shown from the total sample.

Table 4.0
Demographic details of respondents (n=16)

Respondents	Males	Females	Total
Teachers	5	7	12
Heads	3	1	4
Total	8	8	16

The table above shows the sample that comprises of sixteen respondents which were twelve teachers and four heads of schools. Of the sixteen, eight were females and eight were males. They had various levels of teaching experience.

THEME 1: Methods used by teachers to teach Mathematics using ICT tools.

Table 4.1 Teachers' responses on methods used in teaching Mathematics (n=12)

Method used	Number	Percentage
Reciprocal teaching	2	16,7
Drill and practice	7	58.3
Blogs	0	0
Open source software	0	0
None of the above	3	25
Digital story telling	0	0

Results in the table reveal that 58,3% of the total sample use drill and practice method in teaching Mathematics. The statistics shown also indicate that 25% of the respondents do not use the methods identified whereas 16,7 of the sample would use the reciprocal teaching method in teaching Mathematics. When asked on the methods used in teaching Mathematics using ICT tools, the various heads had various views as well. Heads of school A indicated that the method used by teachers in the teaching of Mathematics at junior primary level is drill and practice. This was also outlined by Head B who said that the best method of teaching Mathematics is the drill and practice. Head of school C indicated the demonstration method as the method used in teaching Maths whilst Head of school D thought the reciprocal teaching method is the method which teachers should use in the teaching of Mathematics at junior level.

The findings revealed that there is a need to use methods of teaching and learning that promote cooperation and critical thinking hence the drill and practice method. Learners can easily develop their skills through repetitive practice. Plomp, Brummelhis, Rapmund (1996), say that the use of computers and other ICT tools help develop students' skills for cooperation, communication, problem solving and lifelong learning. This is supported by Evans-Andris (1995) who says in this method of teaching, learners are exposed to software which is intended for drill and practice. It is also evident from the research findings that a

number of teachers do not use ICT tools in their teaching of Mathematics. This fails to encourage learners to develop creativity in Mathematics.

It is evident from the results on the table that most schools are not using ICT tools that relate to methods which have to do with the internet that is open source software and blogs. From the data collected it was brought out by head D who said that

In as much as we may need to use methods of teaching that use the internet, we are however not equipped to do so because of financial challenges. Setting up the Internet connectivity is financially demanding and we cannot afford it.

The school D head's sentiment are shared by Head C whose school does not have the ICT tools who said that

Some of these methods of teaching using ICT tools are too expensive and our schools in rural areas are not ready to use them due to the fact that resources do not permit us. It may take ages before we use some of these methods in teaching Mathematics.

The above statement is in line with what some authorities say. As Cuban (2001) says, developing countries are far from realising the benefits of ICT tools due to certain barriers like finance and cognitive issues.

Teachers' responses on methods used more often in teaching Mathematics using ICT tools (n= 12)

Method of teaching using ICT tools	Number	Percentage (%)
Reciprocal teaching	1	8,3
Demonstration	1	8,3
Open source	1	8,3
Drill and practice	6	50
None of the methods	3	25

When asked to indicate, 50% of the teachers indicated that they use the drill and practice. 25% of the teachers did not use any of the methods listed and an equal percentage, that is 8,3% used reciprocal teaching, demonstration as well as open source methods. Most school heads agreed that the method used more often depends largely with the teacher's approach as well as their knowledge of the content to be taught. Of note was school C's head respond to the above. He said that:

The open source would be the most used method because teachers are always referring to the internet in teaching Mathematics through the use of their mobile phones to access open source software and this is what we are encouraging them because our school does not have any ICT tools to use but still with their devices the Internet may be brought into the classroom when teaching Mathematics.

According to Jason and Kutnick (1996) individuals perform better than groups when carrying out drill and practice activities. This is in line with the teachers' opinion of regarding the drill and practice method as the one used more often when teaching Mathematics using ICT tools. The above shows that the drill and practice method is the method which is mostly used by teachers in teaching Mathematics.

Table Showing teachers' reasons for the methods identified

Method	Responses	Reason for the frequency of the method
Reciprocal teaching	4	There are not enough ICT tools
Open source	1	To get latest information but it's the teacher using it
Demonstration	1	It gives the learners an opportunity to practise on their own
Drill and practice	6	Easy to enhance mastery of aspects because of repetition and works well with the number of ICT tools available

The table above shows that 50% of the respondents choose to use the drill and practice method because to them it enhances mastery of concepts and works well with the ICT tools which they have at their schools. 32% of the respondents use the reciprocal teaching method because they don't have enough ICT tools. The statistics also show that 8% of the teachers use open source method but it is teacher centred and not the pupils. The other 8% of the respondents use the demonstration method because the teachers believe that it gives the learners opportunities to practise on their own. Teachers choose the methods which have been identified because of the reasons which they give.

School heads maintained that the choice of method and the reason solely depends on the teacher. School B head said that:

What really matters is achieving the objectives in the best way possible with the tools available and within the shortest time possible.

This was also supported by school C head who said that;

We encourage teachers to be creative and find the best ways possible that they can use to achieve the set goals. The reason for a choice of method would depend on the teacher and his class as long as they are able to achieve their goals.

According to Goldberg, Russell and Cook (2003) an average learner who uses computers when learning is more likely to produce work of better quality. This is in line with what the responses from the interview with heads of schools were emphasising. The focus is more on quality of work produced regardless of the method which the teachers chooses. Therefore it can be seen from the above that what is more important is not the method itself but its effect. This means there is need to use a method which leads to the attainment of the set objectives.

Theme 2: Support systems needed in order to use ICT tools in teaching Maths.

Table 4.2: Responses on ICT tools available at the schools (n=12)

Tool	Available	%	Not available	%
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Desktops	6	50	6	50
Laptops	5	41.67	7	58,33
Ipads	0	0	12	100
Projectors	6	50	6	50
Flash sticks	6	50	6	50
CDs	3	25	9	75
White boards	3	25	9	75
Printers	9	75	3	25

Results in table 4,2 reveal that various schools have various ICT tools. Various schools have various amounts which of ICT tools which can be used when teaching Mathematics at junior level at the schools. 50% of the respondents have desktops at their schools and the same is true for those who do not have them. 41,67% of the respondents have laptops at their schools whilst 58,33% do not have the laptops. It further reveals that Ipads are not available in the schools whereas an equal percentage have and do not have projectors and the same is true for flash sticks. 25% of the respondents have flash sticks whilst 75% do not have them. 25% of the respondents have indicated that they use white boards whereas 75% do not have them. In addition to these tools 75% also indicated that they have printers and 25% do not have them.

The results show that there is unequal distribution of ICT tools in the schools. Most schools have the basic tools but do not have other advanced and more expensive tools. School heads indicated that their schools may not afford to have the ICT tools needed to be used in the teaching of Mathematics at junior level because of a number of reasons. The head of school D said that;

In our area, our catchment area is mainly made up of peasant farmers and they struggle to pay fees. This means that we face a lot of challenges in acquiring some of the resources we need.

The same was echoed by the head of school B who said that;

What we currently have was donated to us by well-wishers. On our own we cannot afford some of these ICT tools because they are expensive and it may take us time to raise enough money to buy the tools.

The above shows that the schools face a number of challenges in acquiring ICT tools which are needed in the teaching of Mathematics. Therefore the availability of ICT tools has an impact on whether they are used or not.

Teachers’ responses on other ICT tools at the school

When asked to indicate if there were other ICT tools besides those listed, all the teachers’ responded that they had none. 100% of them do not have any other tools except those indicated. None of the respondents mentioned other tools which include other software or hardware needed in the teaching. The Internet was not even mentioned which means that all the schools involved are somehow not connected to the internet and as such they do not use any methods related to it. All the heads who were interviewed indicated that they do not even know how the Internet may be used in teaching Mathematics. School C head had this to say;

*Do we need the internet in teaching Mathematics at junior level?
First we may need the connectivity which we cannot afford then there is its use, but most of us here do not even know how we can use it in teaching primary mathematics.*

The above shows that some software as well as ICT tools are not used by the schools in teaching of Mathematics at junior level. As Owston (1997) writes, the Internet is a truly open technology, allowing users with any hardware and software to derive the necessary information from the network, independent from the location of data and knowledge bases. This means that the internet is a necessary requirement in the teaching of Mathematics at junior level and so schools should work towards obtaining it.

Responses on training required so as to use ICT tools in teaching Mathematics at Junior level

Type of training required	Responses	%
Introduction to computers	4	33,33

Computer training and appreciation	8	66,67

The table shows that the majority of respondents 66,67% need computer training and appreciation so as to use computers as part of ICT tools used in teaching of Mathematics. 33,33% need training in the form of introduction to computers. Most teachers have indicated that they still need a lot of training in the basics of computers. The same was outlined by the heads of schools. School A's head said;

If all the teachers could get trained in use of computers this would mean an improvement in the use of the ICT tools in the teaching of various subjects.

This was in agreement with what the head at school B said. She said the following;

Most of us do not have the basic skills for using ICT tools. To use ICT tools is a challenge to us and that is why we do not use them to teach subjects like Maths. We are still to embark on a programme aimed at acquiring the necessary skills.

At school C the head agreed with what was said by the head at school B as well as what was said at school D. Most school teachers have indicated that they need training in the use of ICT tools. This suggests that without training in the use of the tools the teachers cannot use them even if they are available at the school. According to McKenzie, (1996) for teachers and administrators the biggest barrier in using devices of any type in the teaching and learning situation is functionality and, in some cases, even in total absence of tools. They have limited knowledge in using the tools and let alone the internet. This is further supported by Clemmit, (1996) who said, she had had to spend almost a year before she managed to find the sites with information, which could be used in the teaching. Kilimci (2010), further argues that teachers might find it difficult to use ICT in their classrooms due to the rapid technological development. Therefore there is need for the teachers to have as much training as possible on the latest technological developments.

Responses on support systems needed in order to use ICT tools in teaching Mathematics

All the respondents indicated a number of support systems that should be in place for the use of ICT tools in the teaching of Mathematics at junior primary level. Some of the support systems highlighted include:

Support system required	Responses	%
Stakeholder involvement	5	41,67
Parental involvement	3	25
Former students associations	2	16,67
E-learning experts at schools	1	8,33
SDC involvement in acquiring ICT tools	1	8,33

From the table it can be seen that the majority of respondents indicate that stakeholder involvement is needed in order for the successful use of ICT tools in the teaching of Mathematics at primary junior level. Parental involvement is another form of support system which a number of respondents highlighted.

There is also a need to form former students associations which may help in acquiring ICT tools. Some respondents call for experts at schools who know how to use the various ICT tools so that there is successful use of the ICT tools. Some respondents feel the SDC should play a pivotal role in availing ICT tools at schools since they are the ones concerned about developing the school.

Most heads of schools indicated that parental involvement is crucial as one of the support systems needed. School D's head suggested that in order for ICT tools to be used in the teaching of Mathematics there is need for teachers to be trained in the use of such tools. He said;

Teachers must have adequate knowledge on the use of ICT tools. This must be included as part of their training area at teachers' colleges. As for the availability of these tools in schools, the parents should work hard so that tools are available in line with recent technological trends.

The above was further supported by the head from school C. The head said that;

It's not very easy to get the ICT tools without the support of other stakeholders like the parents, government as well as well wishers. Schools should engage the former students who have made it big in life to help in securing the tools needed. Then those parents who can afford to buy certain tools like computers or laptops for their children, they must be encouraged to do so and if possible the government should come up with a policy in support of parents buying for their children.

School B's head agreed with what the others said. He said that during teacher training programmes there is need to incorporate the use of ICT tools in the teaching of various subject areas rather than simply the teaching of ICT as a learning area. This school head further suggested the in servicing of teachers who are already practising so that they appreciate the use of ICT tools in teaching the various subjects like Mathematics. In as far as availability of tools is concerned he said that;

Policy should also allow for kids to be sent back home to collect levies so that such levies may be used to purchase tools like the computers as well as alternative sources of power like generators and solar panels so that there is minimum disruption of lessons in the event of power cuts. In addition to this parents or guardians should be aware of how these ICT tools are used so that in the event of

Mathematics homework requiring the use of the tools the guardians can easily assist the learners at home..

School A's head thinks that the policy on minimum amount of written work as well as the pressure on the timetable has a bearing on the use of certain methods which require the use of ICT tools. He believes that;

ICT tools may be used easily when teaching ICT as a subject rather than incorporating it in a subject like Mathematics. Furthermore the use of tools like the projector may require setting up first and during the time of setting up some precious time meant for meaningful teaching is lost and may not be recovered. In most cases only one room is set aside at a school as the computer lab so movement in and out of the room by the various classes may end up causing commotion and delays while queuing to get into the lab. By so doing time for meaningful learning is lost again and a teacher can end up leaving the use of the tools and concentrate on the written work requirements.

The above shows that stakeholder involvement is of great importance in the acquiring and use of ICT tools in the teaching of Mathematics. As highlighted by Cuban (2001) developing countries are far from realising the benefits of ICT usage as seen by the inadequate use of these ICT tools in some schools. This suggests that a lot still needs to be done so that countries like Zimbabwe enjoy benefits of the prevailing technology trends in education sector. The teachers need adequate and careful training so that they may be able to use some content-free software such as word processors, publishers and databases. These content-free software are flexible and can be shaped to suit the learners or teachers' needs.

Tondeur et al (2008) support this view and say that there is need for ICT training among teachers so that there is significant integration of ICT in the classroom. Littlejohn (2002) also suggest that there is need for professional development programmes which can provide training to teachers on educational theories with reference to ICT as well as assist teachers in the planning of learning activities that involve the use of ICT tools.

The findings have indicated a number of support systems that have to be in place in order for teachers to successfully use ICT tools in the teaching of Mathematics. These support systems include leadership and policy. As far as leadership is concerned, it was found out that it has a great role to play in both acquiring ICT tools as well as motivating or supporting teachers to use the tools in teaching Mathematics. The leadership's view of ICT tools influences the teachers' use. If school leadership regard tools as useful then they take all the necessary steps to see that it is incorporated in the subjects. This is supported by Lim (2007) who says that policy makers and school administrators need to apply strategies to address the various barriers to successful integration of ICT in the classroom, and must support the creation of necessary and sufficient conditions for that purpose.

Another important aspect that was highlighted from the research findings is the need for a change in assessment policies. There is a need to change the assessment practices so that focus is not only on achievement of grades only in an examination but also on the ICT skills obtained by learners after a learning programme. In support of this view Jones (2003) says that there can be a change on how learners submit their work for assessment that is from the conventional way to the use of digital ways which can be evident enough of use of ICT tools.

Physical and technical infrastructure is another aspect that was highlighted in the research findings. Infrastructure is a fundamental aspect of ICT integration in the teaching of Mathematics. Schools have to look for ways of sourcing the hardware and software needed as well as ensuring that technical staff is also available. Through planning, allocating resources and budget, and giving technical and curriculum support, teachers can implement ICT-based teaching and learning (Littlejohn 2002). In this view Mumtaz (2000), purports that software designers and teachers should work together and consider a range of ways teachers teach in the classroom and how appropriate forms of software supporting different skills and ways of teaching and learning can be made. These initiatives should be done in both rural and urban setups where the learners' backgrounds may vary.

Parental or guardian involvement is another aspect that was revealed from the findings of the study. Guardians play a significant role in their children's learning by providing both financial support as well as learners' welfare. It emerged that since guardians pay school

levies and contribute in acquiring the necessary ICT tools needed and their awareness of school programmes helps to make it easy to help in getting the tools. Once the tools are being used in the learning of Mathematics, guardians may also need to assist the learners in homework and other learning practices. Therefore they need to be aware of how the tools are used so as to help the learners. Afshari et al, (2009) states that it is crucial to involve those who have a stake in the outcomes, including teachers, parents, students, and the community, and allow them to assist in the creation of the vision by contributing their knowledge, skills, and positive attitude.

4.4 Summary

The chapter has attempted to present, analyse and interpret the raw data from the findings on methods of using ICT tools in the teaching of Mathematics at junior level in Makoni South. The data collected through questionnaires and interviews was presented in form of frequency tables and analysed as well. Discussion on the findings was also done. The next chapter is going to look at the summary, conclusions and recommendations of the study.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The study looked at methods of using ICT tools in the teaching of Mathematics at junior primary level. This chapter will provide the summary, conclusion and recommendations of the study.

5.1 Summary of Chapters

The main focus of this study was to investigate methods of using ICT tools in the teaching and learning of Mathematics at junior primary level in Makoni South circuit. The study concentrated on the methods used by teachers and learners during Mathematics lessons. The study wanted to find out the best way of incorporating ICT tools during Mathematics teaching and learning. Chapter 1 covered the background to the study provided the basis from which research questions were derived.

Chapter 2 focussed on review of related literature which highlighted the different authors' views and perceptions pertaining to the methods of teaching Mathematics using ICT tools. This literature review served to answer the research questions raised in chapter one. Some authorities have seen that the drill and practice is one of the best methods of teaching Mathematics using ICT tools like computers and projectors. It also came to light from the authorities consulted that a number of issues need to be looked at so as put in place the necessary support systems for the use of ICT tools in the teaching of Mathematics at junior level.

Chapter 3 focussed on the research methodology and the descriptive survey design was used in this study. Convenient sampling was used to come up with a sample of four primary schools, school heads as well as junior teachers at the schools selected. Research instruments such as questionnaires and interviews were used to collect data on methods of using ICT tools in teaching Mathematics. Data collected was presented in the form of tables.

Chapter 4 presented and discussed data. The following are the highlights of the findings which concluded that some schools do not use methods of teaching that use the ICT tools. Some teachers do not know how to incorporate ICT tools in their teaching of Mathematics. The research findings also revealed that those teachers who use ICT tools in the teaching of Mathematics use repetitive activities through the method of drill and practice.

The findings further revealed that support systems needed include curriculum and assessment changes, parental involvement as well as professional development on the part of teachers.

5.2 CONCLUSIONS

The following part discusses the conclusions drawn from the results. The major findings of the study were summarised according to the research questions that guided the study.

5.2.1 What methods are used by teachers in teaching Mathematics using ICT tools at junior level?

From the study it was seen that some teachers do not use ICT tools in their teaching of Mathematics at junior primary level because of a number of reasons. Some of the reasons that emerged were lack of knowledge and skills as well as shortage of the ICT tools in some schools. The study revealed that in the case of those teachers who use ICT tools, the method used is that of drill and practice. In other few cases it was found out that the demonstration method is used.

5.2.2 What support systems do teachers require for them to be able to use these methods?

The findings also revealed that a number of support systems are needed in order for teachers to use methods of using ICT tools in the teaching of Mathematics at junior primary level. These support system include professional development and training programmes so that they are able to incorporate ICT tools in their teaching of Mathematics. The school leadership and should also come up with policies and ways of acquiring ICT tools.

It was also found out that assessment policies should also change to give room for the testing of ICT skills acquired during the course of teaching and learning. This can be done through digital ways rather than the conventional exams. Physical and technical infrastructure is another aspect of support system that was highlighted in the findings of the study where careful planning and allocating of resources is done so that teachers and software designers work together. The other issue revealed is the involvement of guardians in the school programmes. Guardians provide financial support as well as assist learners with their homework. It is essential for these guardians to be informed of these methods of using ICT tools so that they are able to help learners in doing their homework.

5.3 Recommendations

The following recommendations were made:

- Teachers need to use methods of teaching Mathematics using ICT tools that instil critical thinking and problem solving skills among learners.
- Schools together with the Ministry of Primary and Secondary Education should provide mandatory in-service training for teachers on the use of ICT tools in the classroom. This helps them develop a positive attitude towards the use of these tools as well as keep abreast with latest technological developments in the education circles.
- School leaders should find means and ways as far as possible to involve all stakeholders so as to mobilise ICT resources for use in teaching of the various subjects across the curriculum
- Syllabuses need to be aligned with new changes in the teaching and assessment processes. For example if calculators and computer software are to be used for teaching and learning, assessment should be aligned to this new innovation.
- Schools should have programs in which guardians are taught the use of ICT tools like computers so that it can be easy for them to assist learners in homework and other extension exercises which may be done at home.

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QUESTIONNAIRE FOR TEACHERS

Muvikana Sued is a student at Midlands State University doing B.ED. Computer Science. He is carrying out a study on methods of using ICT tools in teaching Mathematics at junior primary level. May you kindly respond to this questionnaire? The information provided is strictly for academic uses only and will be kept confidential. Thank you

Please put a tick in the box that best describes your response to the item.

SECTION A: BACKGROUND INFORMATION

- 1 Sex: Female [] Male []
- 2 Highest Qualification: Cert Ed/ Dip Ed []
- B. Sc Ed/ B. Ed []
- M. Ed []
- Other []

Specify.....

- 3 Subject majored at College/ University training
- Mathematics []
- Sciences (Biology, Chemistry, Physics) []
- Other []

Specify.....

- 4 Teaching Experience

0-5 years

6-10 years

11-15 years

More than 15 years

SECTION B

1. Tick the ICT tools that you have at your school:

Tool	Yes	No
Desktops		
Laptops		
Ipads		
Projectors		
Flash sticks		
CDs		
White boards		
Printers		

2. Which other ICT tools do you have at your school?

.....
.....
.....

3. Which of the following methods have you ever used in Mathematics? (indicate by a tick)

i) Reciprocal teaching

ii) Drill and practice

iii) Digital story telling

iv) Blogs

v) Open source software []

vi) None of the above []

4. Which method do you use more often in teaching Mathematics using ICT tools?

.....
.....
.....

5. Why do you use the method you stated in question 4 more often?

.....
.....
.....

6. Which form of training, if any, would you require so as to use ICT tools in teaching Mathematics at junior primary level?

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7. Which support systems do you need in order to use ICT tools in teaching Mathematics at junior primary level?

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INTERVIEW GUIDE FOR SCHOOL HEADS

1. What methods are used by teachers in the teaching of Mathematics using ICT tools at junior primary level?
2. What support systems do teachers require for them to use these methods?

PROBING QUESTIONS

1. Do teachers use ICT tools like projectors and desktops in teaching Mathematics at junior primary level?
2. Are teachers familiar with methods like reciprocal teaching method when teaching Mathematics at junior Primary level?
3. Which method would you consider to be the most effective in teaching Mathematics using ICT tools?
4. Which policies have a bearing on the method of teaching using ICT tools?
5. Schools must have hardware and software experts to help in the use of ICT tools. What is your view about this?
6. How can partnership and engagement be improved between the school and other stakeholders?