

Challenges and Opportunities in Harnessing Computer Technology for Teaching and Learning: A Case of Five Schools in Makoni East District

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Abstract

The global swing towards a knowledge based society has seen the role of ICTs in education becoming increasingly important. Zimbabwean education system is among the best in the continent and this achievement ought to be strengthened by the use of ICT in education. The study focused on ascertaining determinants of different levels of computer use at selected schools in Makoni East District in Zimbabwe and to find out whether teachers and heads appreciated the rationale behind establishment of computer studies in their schools. The study was qualitative in nature and relied on interviews and use of the questionnaire. Using the theoretical lenses of the Modernisation Theory, the study revealed that the use of computers for pedagogical purposes is very low. Basing on this, the research recommends a multi sectoral approach involving government, private sector, parastatals and other stake holders to ensure that the education sector benefits from the new technology.

Key Words: Computer technology, I.C.T, Cyber world, digital divide, Knowledge based Society, digital revolution

Introduction and Background to the Study

The Millennium Development Goals set by the United Nations in 2000 highlighted the importance of ICT in the global development agenda. The eighth goal drew attention to the need to ensure that the benefits of new technologies, especially ICTs are made accessible to all (World Summit on information Society, 2003). Production of information and knowledge is growing at an accelerated pace and ICTs serve as a transmission belt in generation, dissemination and sharing of knowledge (Anderson, 2008). The education sector plays a key role in information and knowledge production hence the need to ensure that teachers and pupils are not left behind.

As a developing nation, Zimbabwe needs to be part of this new dispensation which entails integrating new ICT processes into the education system. There is little doubt that Zimbabwe's education sector is missing out on the benefits of ICTs. As the country lags behind in the adoption, use and innovation in ICT, many pupils are losing out on better education and well-paying ICT jobs (kachembere, 2011).

It is through this realisation that some schools in Makoni East district in Zimbabwe are striving to seize this opportunity to exploit the benefits of ICT for the purpose of teaching and learning. Their efforts are informed by the understanding that ICT in education is a significant key driver for pupil achievement through enhanced production of information and knowledge. The effective use of ICT in education also has the potential to enhance achievement among the pupil through greater collaboration, improved communication and opening of wider opportunities to share information (Victoria, 2011). From a broader perspective, the benefits from advances in ICTs could also mean an acceleration of economic and social development and greater inclusion of isolated, particularly rural populations, into the mainstream of society (kabanda 2012).

In Zimbabwe, ICT in education is not a very widespread phenomenon especially considering rural settings where most schools are not connected to electrical power supply and where some schools hardly have any buildings to house the computers.

In fact Zimbabwe remains at the bottom ten of ICT Network Readiness Index (Kabweza, 2011, Reddi, 2004). Makoni East district is largely rural with the majority of the schools unable to offer computer studies due to non-connectivity to electrical power supply. This therefore means that teaching and learning has largely remained rooted in the traditional models of delivery. Suffice it to say that traditional systems of teaching and learning have been outpaced and outstripped by new and dynamic trends. The traditional concept of schooling inside the walls of brick and mortar has been superseded by the spectacle of schooling without walls. Conventional learning set-ups have been overtaken by digital environments and the face-to-face mode of tuition delivery is fast being replaced by online articulated learning and knowledge delivery methods (Kachembere, 2011). Education experts however argue that bringing ICTs into the learning environment will create opportunities for broader education initiatives that will bring pupils into the information era.

In an effort to bring the potentially empowering benefits of ICT to the pupils, the government of Zimbabwe embarked on a massive drive to turn around the education sector by donating state of the art computers to many schools around the country mainly in the rural areas. Concomitant with that was an effort to train computer science teachers who were badly needed in the schools. To that end, many teacher training institutions both primary and secondary were mandated to train computer science teachers or to offer computer appreciation courses to their student teachers among the programmes they offered.

It should be noted, however, that for the past decade, Zimbabwe has been limping under the effects of an economic recession which seriously crippled the education sector and also made the country to lag behind in this vast digital revolution (BWPI, 2009). Some schools have however made significant progress towards harnessing computer technology for the purpose of teaching and learning. This effort has not been without its challenges. Some of the major challenges that schools in the district and Zimbabwe in general are facing are largely associated with the prohibitive costs of purchase and maintenance of computers in the schools. Some schools located in the remote parts of the country have also generally failed to attract not only qualified computer teachers but qualified teachers for other disciplines as well.

After graduating from high school or from tertiary institutions world wide, graduates are expected to join the working fraternity which hitherto has seen a rise in the demand for computer skills (Yelland, 2001). Indeed many jobs in Zimbabwe are increasingly demanding the requisite qualification and literacy in computer technology. It is vital therefore, that pupils are equipped with the necessary computer technology skills to fully empower them to participate in the highly digitalised world from a young age. All sectors of education from primary, secondary, to university, as well as vocational and skills-based education need to harness this technology. This study therefore sought to ascertain the level of computer use among pupils in the district as well as to examine whether teachers and heads appreciated the rationale of introducing computer studies in their schools.

Theoretical framework

The Modernisation theory

The study was largely informed by the Modernisation Theory. The major thrust of the theory is that developing countries need to go through a cultural and economic change in which traditional values are substituted by development oriented goals. The theory presupposes that in order to depart from political, economic and social challenges to achieve development and industrialisation, there is need for a change of values and attitudes of the developing world. This could be achieved through promoting savings and earnings, having capital to invest, promoting growth in entrepreneurial skills base and investing in modern technology (Moore, nd). Through these lenses therefore, the adoption of western technology is one way of reducing the cultural and digital divide between the two worlds. The use of ICT in education would therefore constitute the drive towards realisation of this dream. The Modernisation Theory suffered severe attack from the dependency theory for not taking into consideration factors that led to the underdevelopment of the developing countries (Mutunhu, 2011). However it is important to note that some very significant insights can be drawn from this theory.

Research objectives

The study was guided objectives:

- To establish the determinants of different levels of computer use at selected schools in Makoni East District.
- To find out whether or not teachers and school heads appreciate the rationale for the introduction of Computer Studies in schools.

Literature Review

Many educational institutions in Zimbabwe are increasingly seeing ICT as the missing jigsaw piece in the pursuit of qualitative development of their pupils. This perception is based on the understanding that ICTs can significantly heighten the social, technological, and psychological development of their pupils (Victoria, 2011). Whilst ICTs significantly improve the quality of the pupil, they also give the student a competitive edge ahead of others on the job market. Forester (1985) sees the role of teachers as critical in assisting pupils to appreciate the working principles behind ICTs so that they stop being a mystery to them. The role of teachers is therefore to encourage pupils to be active ICT users and to engage the pupils in productive ICT-driven activities at school. It should be noted that the new generation is expected to take leadership roles in community and economic development. Unless and until it begins to appreciate the importance of ICT and how it can empower them, the digital-divide will leave it back in the Stone Age era.

In Zimbabwe, the 2010-2014 strategic plan for the Ministry of Information and Communication Technology with regards to education is to have one computer per class by 2014. Looking at most Zimbabwean classes with an average of 40 pupils per class, this would translate to one computer for 40 pupils (Zimbabwe MICT strategic Plan 2010-2014:53). This ratio is clearly not workable. A similar trend is also evident in other developing countries like Zambia and Mozambique. If the future generations in Zimbabwe stand to be relevant to the demands of the cyber world and if the challenges associated with the automated and highly technical society of today are to be surmountable then the education sector must guard against the threat of producing an irrelevant generation. Teachers are thus expected to convey this message to the students before they graduate from school (Cowan, 1989).

Justification of the study

Computer technology is central to the creation of a global 'knowledge-based society'. Many parents not only in Zimbabwe but throughout the developing world are therefore increasingly getting to realise the benefits of computer technology. According to the Modernisation Theory adoption of technology is a building block to better quality of life (Moore, nd). The parents understand that not only does the possession of computer skills enhance their children's chances of getting a good job after leaving school but they also broaden their children's intellect horizon.

Balanskat (2006) is of the opinion that students assume greater responsibility for their own learning and working more independently and effectively when they use ICT. Diverse learning situations equip students with a range of skills and work techniques thereby developing confidence in their own capacity to learn, this eventually enables them to perform better. Empirica (2006) states that pupils are more motivated and they participate more actively when ICT based teaching approaches are being used in the class. This motivating effect of ICT can be linked to a change in attitudes and a greater involvement in learning activities dialogue and collaboration among students. Use of computers can also promote enquiry and build up the students' interest in the subject leading to child centred and investigative learning. This is because a computer can execute numerous tasks; it can be used as a science laboratory, a teaching machine, a workbook or a personal tutor. It also draws students into the world of critical thinking (Benzion, 1994, Vaugh, 1997). Applications like logo and hyper studio are among the most popular and versatile computer programmes that teachers could utilise for teaching and learning. Through drill and practice, critical thinking is promoted and through computer simulation, independent mastery of skills, concept development and the skill of enquiry is enhanced. The word processor can improve pupils writing skills. Spread sheets can promote mathematical skills and playing computer games can assist students learn how to process facts and make logistical inferences while solving a problem that is interesting to them (Grabe and Grabe,2007).

The internet is an information gold field and it is newest and most powerful in the world of educational computing (Varron, 2011). What makes it so powerful is that it makes the student freely search for educational material or useful information like online books, journals, periodicals, films and other educational materials making the whole world come to one's door step educationally. The study therefore is important in sensitising the Ministry of Education Sport Art and Culture, the Ministry of Information Technology and Communication and other stakeholders, parents included of the need to lend the necessary support to the education sector with regards to ICT for the benefit of the pupils.

Limitations of the Study

The major limitation of this study is that by looking at the five schools located in different geographical areas and belonging to different responsible authorities, the study was not able to give a comprehensive comparison of the five schools. Some responsible authorities have been very aggressive in terms of sourcing computers for their schools whilst the rate of acquisition of computers in other schools has been slow. Notwithstanding the above limitations, it is hoped that valid insights for future interventions can be drawn from this study.

Population and sampling

The study population was four hundred (400) teachers and fifteen (15) school heads from which a sample of fifty (50) teachers and five (5) school heads was chosen. The five schools were purposively chosen on the basis of their different responsible authorities and the fact that the schools are located in reasonably different geographical areas. Two government day schools (urban and peri urban), one rural council day school, one rural mission boarding school, and one rural private boarding school formed the sample. This was meant to provide diverse views regarding the level of computer use in the schools because as conditions differ geographically or otherwise, experiences are also bound to differ.

These five schools were considered to be relatively well established schools in Makoni East district and therefore were in a position to provide traceable records of computer establishment processes in their schools.

It was also noted that the schools were examination centres for the Zimbabwe Schools Examination Council Exams including computer studies. Schools who offered computer studies but were not host to ZIMSEC exams in computer studies did not qualify to be part of the sample.

Schools were put into strata based on their geographical location and responsible authority and one school was randomly chosen from each stratum.

At each school, the names of the teachers were put into two separate boxes one for males and the other for females, the names were then picked at random. Four males and four females were selected for questionnaires. Using the same method, one male and one female were selected for interviews. This brought the total number of respondents to ten teachers per school. Stratified random sampling was thus very useful in ensuring gender balance. The researcher chose to interview two teachers per school that is one computer studies teacher and a non-computer studies teacher. This was meant to validate some of the information gathered from the questionnaire. It was hoped that more detailed information could be solicited from computer teachers who were charged with the task of teaching computers studies on a daily basis.

Research Methodology and Data collection

The research was qualitative and heavily relied on interviews and use of the questionnaire. In order to understand the determinants of computer use for teaching and learning, the feelings, opinions, attitudes and perceptions of the participants in the study, had to be taken into account. Teachers and heads as human beings have feelings, emotions and perceptions and the qualitative research model is suitable to probe such inner feelings. Through interviewing both the teachers and the heads, the study was thus able to gather in-depth data on the level of computer use, impediments to effective implementation of computer studies subject in some schools, and the extent to which teachers and heads appreciated the need to offer the subject in their schools. The data obtained through interviews was analysed manually. Although the study preponderantly used the qualitative model, quantitative data was also collected in the process.

This in line with Babbie (1986) who asserts that a number of social researchers have since realised the need to use both types of data (mixed methods approach) if a true picture about a phenomenon is to be revealed. In this research, quantitative data that was gathered included statistics relating to classes taking computers, number of computers in the respective schools, number of qualified teachers teaching computers and the ratio of students to computers. This was meant to generate a hypothesis on the extent to which computers were being used for teaching and learning in the schools. The data collected using the questionnaires was analysed using the Statistical Packages for Social Scientists (SPSS) Version 16.0.

Results and discussion

Computer use in the school administration.

On the issue of whether the schools used computers for administrative purposes, all the five (5) heads, (100%), indicated that use of computers was crucial for the running of the school. The heads cited various areas for which computers were being used in the administration of their schools.

Table 1: Functions of computers in the school administration

School	Purpose for which computers were being used.
school A	Keeping financial records and typing administration material like students and staff records.
School B	Typing administrative documents like minutes and circulars.
School C	Typing examination materials, making exam schedules and the school timetable.
School D	Keeping enrolment figures, typing and performing other administrative functions.
School E	Typing the timetable, exams and keeping school records.
Total (5)	

Sentiments raised by the heads reveal that despite some challenges that the schools were facing, computers were being used to perform administrative work of which the most common was typing and storing administrative and financial records. Heads from two government schools indicated that since they had very few computers and considering the high pupil- computer ratio which stood at about one computer per forty pupils., it was prudent to allocate most of the computers to the students and retain only a few for administrative work.

The heads also indicated that most schools did not have the resources to purchase enough computers for the whole school. Some schools benefitted from donations made by their School Development Associations (S.D.As) and individual parents, as some heads indicated:

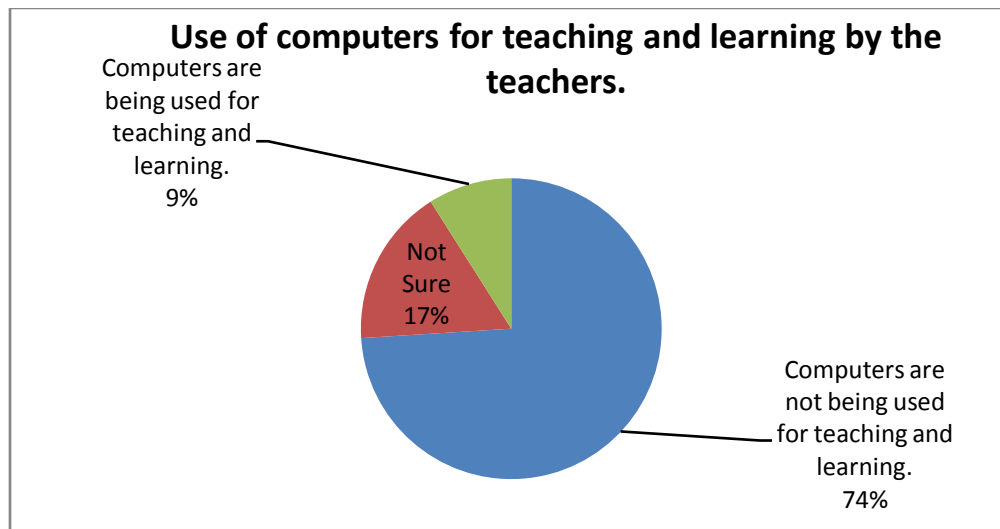
We got all computers from donations through parents, well wishers and our S.D.A. (Head, peri-urban government day school).

Most of our computers were donated to the school last year though the school had a few of its own. (Head, rural mission boarding school).

Use of computers for teaching and learning across the curriculum.

In response to the issue of whether computers were being used across the curriculum, the majority of the interviewed teachers (74%) indicated that computers were not being utilised in all facets of the curriculum as show in fig 1. They indicated that the use of the computers must spread across all subject areas, other than just being used as instructional tools in a single subject area. In fact, the teachers observed that computers were being utilised solely for computer studies lessons. It should be noted however that through utilisation of suitable software, computers could be used to teach subjects like maths, science, geography, art, physics, biology and other subjects.

FIG: 1. Use of computers for teaching and learning by the teachers.

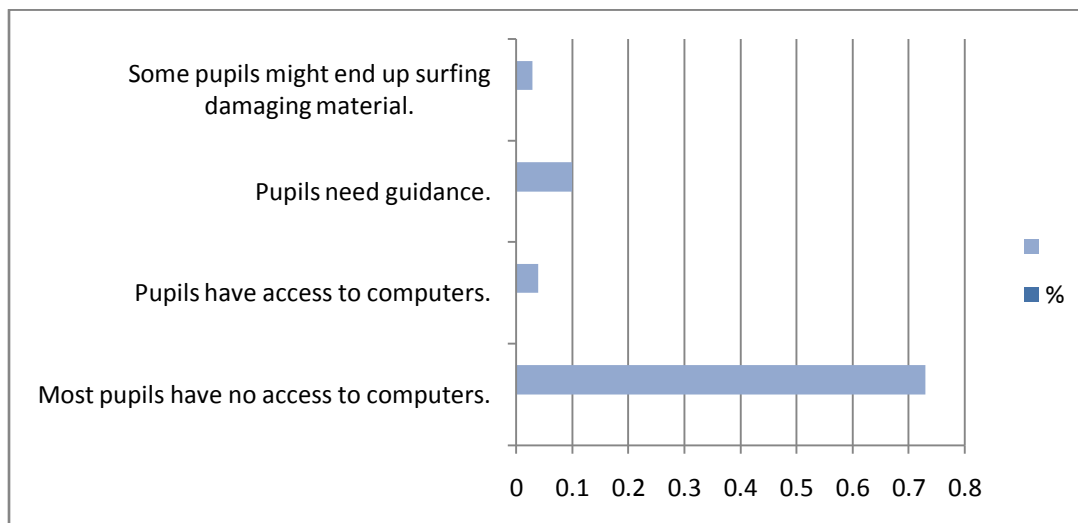


Failure to use computers across the curriculum could lead to churning out of school graduates without the requisite technical skills to effectively tackle the challenges they would meet in the cyber world. Some teachers felt that connecting the computers to the internet would greatly enhance the pedagogical practice. Some of the teachers raised the following sentiments:

- In the absence of the Internet, computer technology is not very effective because we will be missing a lot in terms of information. (Non-computer teacher, rural private boarding school).*
- Personally, I spend much of my time researching on the Internet than doing any other business with the computer. (Computer teacher, rural mission boarding school)*
- I frequently use the Internet for teaching and learning purposes but I am always frustrated by incessant cuts to the network system due to poor connectivity (Computer teacher, rural council day school).*

The teachers were however quick to reiterate that challenges of bandwidth capacity, interrupted power supply and shortage of qualified teachers had hampered the efficient use of computers in many schools not only in Makoni East district but countrywide. A few teachers (9%) felt that computers were being utilised effectively for teaching and learning. They felt that the knowledge that pupils were acquiring from the computer studies subject could also be applied to other subject areas.

FIG 2: Access to computers by pupils not doing computer studies



As indicated in fig 2, most teachers (72%) stated that pupils who were not taking computer studies as a subject were barred from using the computers. Their arguments were that the limited number of computers militated against accommodating large volumes of pupils. This was compounded by the fact that most schools did not have enough qualified computer teachers to monitor the pupils who might want to use the computers during their free time. They felt that such a situation could lead to students abusing the computers. It should be noted that it is at this stage that pupils must be exposed to computers as. Only a few teachers (6%) indicated that students not taking computers had reasonable chances of interacting with the computers in their schools.

Heads views on access to computers by pupils not doing computers.

With regards to accessibility to computers by students who did not take computers as a subject, three school heads, all from day schools, concurred with the teachers that it posed logistical challenges for students who were not taking computer studies as a subject to benefit from the use of computers. The heads argued from a slightly different dimension that:

We do not have extra manpower to carry out such a programme, the only trained computer teacher that we have, is operating under heavy constraints in terms of the volume of pupils he has to cater for. (Head, urban government day school). Employment of technicians

Save for those who are actually taking computers as a subject, we do not normally extend the privilege to use computers to pupils that are not taking the subject, this obviously breeds administrative challenges for us. (Head, peri-urban government day School).

Not every pupil is in a position to benefit because we do not have enough resources in terms of both manpower and the gadgets besides that we do not have adequate infrastructure for that purpose. (Head, rural council day school).

Two heads, one from a rural government school and the other from a rural mission boarding school, intimated that pupils not studying computer studies had access to them once a week on selected days as stated below:

Generally, all our students are expected to take computer literacy lessons once every two weeks, logistically, we have encountered some challenges but we are moving on. (Head, rural mission boarding school).

We have a programme in place designed to ensure that every pupil benefits from our few computers on selected days. (Head, rural private boarding school).

Access to computers by teachers not teaching computer studies

As a way of trying to establish the level of computer use in the district the research also sought to find out whether teachers who were not teaching computer studies were allowed to use them.

All the heads and teachers who responded to the questionnaire concurred that members of staff were not restricted from using computers though some teachers mainly the old ones did not show any interest in using them. The heads indicated that some teachers used computers to type their work as well as to surf the net. It is hoped that through interaction with the computers, teachers would be able to gain insight into how the machines operate. This would enhance their capacity to deliver effective lessons using them.

Study results in the district show that the use of computer technology for the purposes of teaching and learning is still very low. Teachers are still largely relying on the traditional talk and chalk mode of delivery. Poor ICT competences and lack of confidence in using new technology have been viewed as determinants of their levels of engagement in ICT. This confirms Ndlovu's (2012) observation that though a number of schools in Zimbabwe claim to be offering computer studies, it is only a minority that is benefitting. Computer studies as a subject is still a preserve for very few pupils. This challenge is a result of the shortage of computer textbooks and trained teachers as well as lack of proper facilities that go along with the subject. Within the Modernisation framework it would be desirable for Zimbabwe to invest heavily in computer technology so as to create a reasonable

Recommendations

- School heads should work out modalities to ensure that all pupils benefit from the meagre resources available in their schools. Offering computer appreciation evening classes in the case of boarding schools might be one way of going round the challenge.
- Colleges and universities must invest in training and in-servicing teachers in computer technology critically needed in the schools. The Ministry of Education Sport Arts and Culture (MoESAC) should work towards engaging skilled personnel to teach computer studies.
- The Ministry of Education Sport Art and Culture should mount programmes to in-service teachers who did not do computers on basic computer skills so as to be better positioned to assist their pupils.
- MoESAC should also work with the Zimbabwe Electricity Supply Authority (Z.E.S.A), Rural Electrification Agency (R.E.A) and TelOne (a telecommunication company) to expedite connection of electrical power supply to some schools as well as upgrading telecommunication infrastructure respectively. It is also imperative that the schools engage technical support that will ensure that repair services and technical information is provided.

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