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A comparison of the use of Computers by Secondary School Teachers in Kenya

Florence Y. Odera
Bondo Universty College

ABSTRACT

During late 1990s, the Minister for Education in Kenya launched computer education program for public secondary schools. The main objective was to help large number of secondary students to be computer literate. This was in response to the perceived problem that a lack of computer skills was preventing Kenyan youths from acquiring jobs in the world market. However, the Minister gave no indication of how computers were to be used. Whether computers were to be integrated and used to assist in the mastery of those specific curriculum areas taught in secondary schools, or computers education was to be an optional subject or compulsory subject. The purpose of this study was to investigate how secondary school teachers use computers in public secondary school in Nyanza Province. The main objective of the study was to identify public secondary school that had computers and to provide evidence regarding utilization of computers in teaching. Related literature for this study revealed that learning with computers improves quality of education. The area of the study was Nyanza Province. Saturated sampling technique was used to select a sample of eighty computer teachers. This included 44 male and 36 female teachers. The study schools consisted of 32 girls, 44 boys and 4 mixed secondary schools that had computers at the time of this research. Data was collected by use questionnaires, semi-structured interview and documentary analysis. Data collected was analyzed by use of descriptive statistics and presented qualitatively and quantitatively that included percentages and frequency. The findings of this study showed boys schools than girls used computers in teaching/learning. 50% of the teachers were encouraged by the Principals of secondary schools to use computers while 30% were partially encouraged but 20% were keen and made their own effort to learn and use computers in teaching. The other results showed that teachers used computers to improve students' communication skills, to teach English language, Science, Mathematics and computer literacy skills. The majority of schools did not have enough computers for students, lack of support materials and teachers were not adequately trained in the use of computers. In view of the above findings, the study therefore recommends that all teachers should be trained to teach computers and all secondary schools be assisted or supplied with enough computers and computer materials.

Keywords: *Comparison, Computer, teaching, learning, teachers, subjects, secondary, students, Kenya*

1. INTRODUCTION AND BACKGROUND INFORMATION

Kenya is a developing country with a fast growing school population, and there has been an increasing demand for a new method of teaching and learning to meet the needs of the teachers, students and the public at large. The use of educational technology is considered as promising a great deal to those who seek for radical change in educational curricula and techniques because of its potential to provide quality education (Maiyo 1990). Technology especially computer skills plays a key role in promoting the economic development of a country. Many of the productivity gains in the developed world economies over the past decade can to a greater extent be attributed to the impact of technology in particular computer. That is why the Minister for Education in Kenya announced the introduction and use of computers in public secondary schools so that students could be computer literate. This would assist them to achieve national goals and to advance their knowledge as they prepare to venture into various careers in the areas of Information Communication Technology (ICT), and to be able to compete for jobs in the world market (MOE 1998). Teachers and students were also expected to access information for class work, to improve the quality of

education, to help with assignment, to assist teachers with preparation to teach computer literacy skills and research projects. Apart from offering direct instruction, computer could be used to supplement the teachers' work by offering interesting multimedia presentations of learning experiences (MOE 2005).

Researchers from developed countries have reported the use of computers as a tool to teach computer literacy skills, to do complex calculations, data manipulation, word processing and presentation, either within the existing school subjects or in special courses (Azita 1999, Clark 2000, Crook 1994, Heinich, Molenda, Russell and Smaldino 2002, Zhang 2000). Nicholas,1996; Owston and Wilderman 1997). Zhang 2000) also report the use of computers to learn word processing. They indicate that a word processing is a writing tool just like a pen or pencil. It is a valuable tool used in all introductory computer literacy courses. At the same time, Alessi and Trollip (1991), Heinich, Molenda, Russell and Smaldino (1996), Ken and Anderson 1990) indicate the use of computers to learn spreadsheet. Heinich et al (1996) in particular describe a spreadsheet as a page of numbers and columns that display of words, numeric and formula entries, average and manipulate data. They point out that spreadsheet program are easy to use tools that should be exploited by teachers and students to create graphic from

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data.

Alkin (1992) specifically reports that computers have been used in secondary schools in developed countries for the purpose of teaching programming. It is claimed that programming skills will lead to a better or more rapid development of higher cognitive skills or improve thinking, comprehension of basic concepts, problem-solving abilities, planning abilities and precision of expression and to lead to the discovery of powerful ideas.

Furthermore, researchers have examined the use of computers to maintain Database (Heinich et al. 1996, Anderson and Ken 1990). A database is a computer program intended to keep information in an ordered form like a filing system. It is simply a collection of related information organized for access to specific items of information. Heinich et al (1996) feel that students in schools need to learn how to manage information, to sort out resources, to organize information and to evaluate their findings. Several studies have recently examined learning traditional subjects like mathematics, sciences, English language, Social studies, and graphics with computers (Azita 1999, Christman and Badgett 1999, Sadker and Sadker 2002, Olkami 2007, Wafula and Wanjohi 2007, Woodrow, 1994).

The ability of computer as a tool for teaching and learning graphics has been reported by Heinich et al (2002). Crook (1994) also reported the same usage in schools in Britain. There are many ways a teacher can employ graphics in lesson presentation e.g. using graphics as the primary information; using it as analogy; the picture could be the main concept; focusing attention on important text information; using computers to extend the learners' experience of drawing, writing, production of geographical shapes, classifying and calculating. San Jose (1995) believes that a computer integrated education approach is the best for teaching students graphic skills. He further states that in the field of drawing and design, many professional graphic artists now rely on the power of computers.

The second usage of computer involves direct instruction in school subjects (Heinich et al. (2002). Several studies have recently examined learning mathematics with computers Azita (1999, McCoy, 1996). They noted that computers have been used to teach mathematics in three distinct ways: programming logo, Computer Assisted Instruction (CIA) and as mathematical tool.

Previous studies on learning science with computers have indicated the capabilities of computers to improve students' scientific knowledge. This includes sophisticated laboratory and simulation tools. Heinich et al (2002, and Christman and Budget 1999) support the approach to integrate computers into curriculum and hence into teaching science. Computers have also been used successfully in teaching and learning subjects such as social studies, economics, geography, history and languages. With use of computers, students are able to handle more complex assignments, development of

historical imagination, critical analysis and understanding of historical events in the world. Computers have also been very effective in teaching and learning communication skills more so in foreign languages like English (Carol 1997, Crook 1994, Heinich et al (2002). The value of computer is also noted in teaching and learning sentence construction, comprehension, composing stories and composition, and creative writing. Heinich et al. 2002) recognized the ability of the computer in teaching and learning English language and reported that 'spelling and grammar checking are available to students. A thesaurus makes it easier for them to find the right word for a specific situation.'

Graphic programs are also available for teachers and students to learn (Heinich et al (2002, Crook 1994, and San Jose 1995). These scholars report that teachers could use computer to extend the learners' experience of drawing, writing, production of geographical shapes, classifying and calculating. The researchers also noted that in the field of drawing and design, many professional graphic artists now rely on the power of computers.

Barrett (1999) reports the third usage of computer in school administration. Barrett noted that technology assisted school administration to save time ordinarily spent on routine tasks such as budgeting, communication, and preparation of payroll. It was observed that aces to information for decision-making became so important asset in the operation and effective management of the schools.

The above skills were considered useful in preparing students for higher qualification in computer technology as well as for getting jobs. This will also help to improve the overall management of the schools organization machinery. That is why the Minister for Education in Kenya encouraged Principals of public secondary schools to introduce computer education in their schools. The present study was therefore, designed to find out if public secondary schools in Nyanza Province used computers in teaching and learning; and to compare the pattern of usage, to examine whether computers were employed for similar reasons in Nyanza Province as in developed countries. The following assumptions were tested:

- All schools with computer use them as tools for teaching and learning
- Computers are used in more girls schools than in boys secondary schools
- Computers are effective in teaching students academic subjects and computer literacy skills;
- Teachers and students value computer as a tool for teaching and learning.

2. METHODOLOGY
Study Area

The study was conducted in public secondary schools that had computers in Nyanza Province. Nyanza province is one of the eight provinces in Kenya. The new

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constitution divided Nyanza province into seven counties. It borders Western province to the west, Rift Valley to the North and the Republic of Tanzania to south. Nyanza Province also includes part of Lake Victoria. There are over five hundred secondary schools both public and private.

Research Design

The study used descriptive survey design that included both qualitative and quantitative methods. Descriptive survey design was adopted for this study because of its appropriateness in seeking to obtain relevant information that describes existing phenomena and to find facts that yields accurate information (Gay 1992). The researcher aimed at getting accurate information on availability of computers and how teachers use them in public secondary schools.

The Study Population

The study focused on all 80 secondary schools that had computers in Nyanza province at the time of this study. This included 40 boys, 34 girls and 4 mixed secondary schools. The participants consisted of 44male and 36 female teachers.

The Sample and Sampling Technique

Saturated sampling technique was used to select 80 teachers who used computers in teaching and learning. The respondents were male and female drawn from rural, urban and sub-urban areas. This included 44 male and 36 female teachers.

Instrument for data collection

The main instruments used for data collection were the questionnaire, document analysis and semi-structured interview. The instruments were used to collect both quantitative and qualitative data for this study.

Data collection Procedures

The collection of data was carried out in two stages. The first stage concentrated on a selective review of previous relevant literature on the use of computers in teaching and learning. The second phase was concerned with conducting a semi-structured interview with computer teachers using in-depth interview, note taking, probes and audio tape recording.

Data Analysis

Data analysis combined qualitative and quantitative methods. Qualitative data analysis was used for the interpretation of documents, discussions and interviews. The quantitative data analysis was based on simple tabulation that included frequency and percentages (where possible) of teachers' responses to different issues. Qualitative analysis was used because it enables more detailed views of the topic to be presented.

Findings

From the list of seven items examined in this study, the results were as follows:

3. BACKGROUND INFORMATION ABOUT THE SCHOOL AND PARTICIPANTS

The results of the interviews on the type of study schools showed that there were 40 boys, 36 girls and 4 mixed secondary schools in the study representing both rural and urban and sub-urban areas. However, specifically:

- 70% of the computer teachers were from rural areas while 15% were from urban and another 15% from suburban. The majority of computer teachers 85% were male while 15% were female.
- 25% of the participants taught computer education in all classes; the other teachers 70% taught computers in form one, two and three, while 5% taught computer education in form four.
- Computer was compulsory in most of the girls' schools than in the boys schools.

4. USE OF COMPUTERS IN TEACHING AND LEARNING

The interviewees reported that they were encouraged to use computers in teaching and learning by the Principals in order to teach students computer education as in the official computer syllabus. 50% were highly encouraged, while 30% were partly encouraged and 20% reported not being encouraged to use computers in their schools, but did so on their own initiative since computers were available in their schools.

Reasons for the use computers in teaching and learning

All the interviewees reported using computers to teach computer literacy skills, word processing, spreadsheet, database management and programming.

- Preparing learning materials such as teachers' lesson notes, students' handouts and examination materials.
- To improve the quality of teaching and learning by using the materials not easily available to the teachers.

- Learning, especially from the Internet, educational materials on subjects like Biology, Physics, Mathematics and History.
- To teach students computer science, hardware and software.
- To process students results, e.g. ranking of students, assigning grades, analyzing of performance index for class and overall performance index.

However, the overall findings indicated that all the interviewees 100% used computer to literacy skills, word processing, Spreadsheet, database management, graphic and programming. 40% of the male teachers said that they used computer to teach traditional subjects like Mathematics, Science, Languages and Technical drawing, but 20% used it to get new ideas for curriculum subjects like statistics, language e.t.c, while 10% reported using computers to motivate students to learn on their own. Similarly, 10% of them used it to keep school record, students examination marks and grade analysis and 20% of the female teachers used it to improve learners' communication skills.

5. HOW TEACHERS USE COMPUTERS

The responses showed that teachers (65%) from boys schools used computer as a tool for teaching and learning while 35% used it as a source of information.

Teachers' preparation to teach with computers

The findings institutions showed that 80% of the interviewees prepared for teaching with computers and 6o% had no schemes of work while another 60% reported having lesson plan, but 75% did not have lesson plan. All of them agreed that the use of computer enabled them to produce neatly written lesson plan.

Pattern of using computers in teaching and learning

The results indicated that some teachers used computers for drill and practice skills. One of them from a rural school reported that "*Yes I drill them especially for them to be acquainted with the use keyboard for faster typing of text, and also to know where different keys and groups of keys are*". Another one from urban said, "*After learning in groups I drill them to compose letters and stories which improves their writing skills*". Still another interviewee said, "*With computers students learn better with drill and practice. They practice on their own after demonstrating to them*". A summary of the findings on patterns of using computers in teaching and learning indicated that 40% of the teachers used computers for drill and practice, 50% of the them used it for enrichment, and another 40 percent used computer as a tutor to assist

the teacher. There were also 50% who used computer for supplementary work, another 45% reported using computer to learn new ideas, while 60% indicated using the technology for remedial work.

In addition, most of the interviewees noted that computer program could make the learning process easy for students since they learn by doing as one of them said, "*Once the students have done statistics in mathematics, they come and work on the computer to solve the same problem*".

Software used by the students in schools that participated in the investigation

The response from the participants were summarized and showed that all teachers who participated in the study used word processor. About 75 % of them used spreadsheet, and another 70 indicated that they used database. There was also 40% of them who used graphics. Programming was used by 30% of the participant, and other programmes were used by about 35% of the participants

Word processor was used because the packages are by far the most common application of information technology used in schools in developed and developing countries. Spreadsheet was used by 85% of the respondents who noted the importance of spreadsheet as a useful tool for improving mathematical operation and accounting.

6. BENEFITS OF USING COMPUTERS IN TEACHING TRADITIONAL SUBJECTS

The response to this question was varied. Most of the teachers 55% liked the programs because some of them linked very well to subject areas. Another 30% noted that computer programs are well designed and provide learners and teachers with new knowledge. At the same time there were also 35% of the female teachers who liked the programs because they provide information not easily available in textbooks. Another group of participants 85% agreed that children enjoy and learn new ideas when they interact with computers. Some of the male participants observed that computer programs cover topics not available in the syllabus so it provide them with insight into teaching the subjects. Furthermore, most of teachers 85% believed that computer motivates students to want to learn, and 59% agreed that the use of computer help to improve learners' communication skills.

The main reason that encouraged teachers to integrate computer technology into teaching subjects was that teachers felt computer programs were well researched, well presented and formed links with traditional subjects as reported by 75% of the interviewees.

7. STUDENTS' KNOWLEDGE OF COMPUTER LITERACY SKILLS

The findings indicated that 40% of the teachers reported their students had basic knowledge of computer literacy skills. They noted that students were able to operate the machine on their own, use the mouse, keyboard, access files processing their work and print. Another 40% of the teachers reported that students had average computer skills and were capable of using a word processor to compose stories, edit the work and retrieve files. While 20% of them had advanced computer literacy skills and were able to use most of the software tools such as word processor, spreadsheet, database and basic programming. However, the current research did not attempt to gather evidence directly from students to verify the teacher's claims about the computer skills of their students.

How students learn with computers

All the teachers interviewed reported that their students learnt with computers in small groups. When asked to give reasons why the students learn in small groups, one of the participants replied that *"learners are action based so they do not enjoy so much theory and while in groups they consult one another"*. But 50% of the interviewee reported that their students learnt with computers individually when they are given assignments, during practice or when doing examination. 75% said that their students learnt with computers as a whole class in addition to individual and group work. One teacher remarked, *"When I am teaching theory, introducing the students to the working of the machine and types of software, I teach to the whole class"*. Another teacher reported *"Although I allow the students to use computers individually, I must be present to assist them and guard against those who just play cards or smuggle their diskettes with viruses"*. Still another teacher remarked, *"Sometimes I give direction and help learners one by one with using computers to compose stories"*. From these findings, it seems that teachers recognized the need to vary their methods of using computers to meet the needs of the students and demands of what they were teaching. In addition, the majority of the interviewees 70% reported using computers more than four periods per week.

The impact of computers on students learning

The results indicated that most of the interviewees had not integrated computers into their general teaching and learning processes but one of them responded *"If I am using computer during literacy classers I may make reference to the topic in my subject area then the students look at it in the computer"*. Another teacher reported, "I *use the computer to summarize what I have taught by showing some skills in different subjects e.g. Science, Mathematics and History*. However, most of the participants had not been exposed enough to computers to be able to integrate them into teaching and learning.

Value of using computers in teaching and learning

The findings indicated that 65% of the interviewees regarded computers as highly valuable compared to 15% who believed that computers were not valuable and 20% rated it valuable. However, further analysis indicated that 70% rated the use of computers very valuable. One of them commented. *"The use of computers technology, especially in productivity; the way files are kept is exemplary, due to easy access to them, alterations are very easy too"*. Another one said, *"computer makes work easier i.e. much better than a typewriter or a calculator"*.

Attitudes of teachers towards computer education

The findings showed that 60% of the interviewees had a positive attitude while 30% were very positive and only 10% had a negative attitude towards the use of computers. However, it was revealed that teachers generally had a phobia for computers. They fear it so they develop negative attitude about it.

Teachers' comments about the use of computers to motivate students

The response showed that the majority 75% believed that computer highly motivate students while 25% rated it motivating as one teacher said, "*the use of computers have really increased the students desire to learn. They are normally very motivated and this enables them to learn even more on the subject area*". Another teacher said "*in mathematics, there are computer program dealing with mathematics that motivates students so any time they are free they ask me to allow them to go to the computer room to learn with computers on their own*". Still another science teacher said, *"Students are eager to respond to the computer. It has challenged them to search information from the Internet and they come and ask me what they learnt in science"*. In conclusion, most of the interviewees reported that computer programs are presented in simple and interesting manner. Some teachers also reported that students are always *"excited and lively"* when it is time for computer lessons.

Teachers' comments about computers increasing students' knowledge

All of the participants (20) believed that computers were effective in this respect. They agreed that through the use of computers students have learnt and increased their scientific knowledge. 70% believed that computer increase knowledge/information while 30% said with the use of the Internet, students' access information on different subjects from various libraries or databases.

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As one male teacher remarked "*Yes it increases knowledge of English subject e.g. when students access the thesaurus it gives them view words and alternative words and phrases so they learn new things*". This helps to increase their knowledge of other subjects they learn in class. It also helps to improve their communication skills.

Views about the use of computers to widen access to education

All of the interviewees responded positively and gave various ways in which computer helps to widen learners access to education by: providing various new educational programs and distance learning, through e-mail, Internet and it does not discriminate between learners.

Views about computer introducing new ideas

The findings revealed that 90% of the interviewees believed that computer introduces new ideas to teaching and learning. They indicated that both the teacher and students learn something new from computer programs, as one of them reported "*in computer new ideas come up every time when you access the help facilities e.g. most programs*. Another one said "*in mathematics, the computer helps me to teach graphs, square roots, cube roots and means etc.*

Teachers' views about computer improving traditional subjects

95% of the interviewees believed the use of computers helps to improve learning traditional subjects as one of them reported, "*as a result of using computers students managed to pass their examination in mathematics, science, technical subjects and accounting*". *Another teacher said, "My students improved in Biology after I used computer program because the computer gives vivid information that interprets visual aids*

Teachers' views about computers increasing students' attention to learn

The majority 85% of the interviewees agreed that students are more attentive when they are in the computer room learning with computers compared to when they are in their usual classrooms. Most of them reported fewer discipline problems during computer lessons.

8. CONCLUSION

Computer education has not been implemented effectively in secondary schools in Nyanza Province of Kenya. This study established that out of 542 secondary schools in Nyanza Province, only forty secondary schools used computers applications in teaching and learning. On average, schools allocated four or five periods per week for computer education classes. The majority of the participants reported using computers adequately in teaching and learning computer literacy skills. This included learning word processing, spreadsheet, database, basic programming and graphics. In addition, computers were used for administrative duties such as keeping students' enrolment records, examination marks, and for general correspondence and communication purposes.

Computer integrated education is a new terminology to many teachers so it was not highly valued. However, the results showed that some computer software such as the spreadsheet linked properly with some topics in mathematics subjects, commerce and account. A few teachers had also incorporated computers into teaching traditional subjects like Science, Social studies and English language. They also expressed positive views and opinions about the potential of computers to motivate students to learn traditional subjects effectively on their own, and regarded it as a very valuable tool that provide good programs presented in stimulating and interesting manner that helps to introduce new ideas, widen access to education, and improve teaching and learning.

Moreover, the interviewees unanimously noted the impact of computers on students learning that demonstrated a high level of interest during computer lessons. Teachers reported that learners were lively, keen and eager to learn computer skills. Students recalled what they learnt from the computer program and were very attentive and concentrated very much on the machine to learn new skills such that after the computer lesson, students discussed what they learnt with their peers and consulted teachers on various points of the topics they learnt.

Furthermore, the study revealed factors that affected the use of computers in most of the schools as lack of appropriate software, lack of support materials, insufficient computers, lack of trained teachers in specific curriculum skills and classroom implementation strategies, and lack of enough time to use the computers in teaching and learning, lack of power and the others experienced problems with inadequate software and lack of support materials. Others were not able to use computer effectively due to limited access to software not available locally, and teachers were not adequately trained to integrate and use computers in teaching and learning.

However, the participants suggested various ways to improve the use of computer in schools. This included a clear government policy on the provision of computers to schools, teacher training in the use of computers, and the knowledge of curriculum issues in relation to computer education, increased awareness and knowledge of software packages for integration were also cited. Lastly, it is worth to note one important limitation of this study. Teachers reported what they were doing with computers but the researcher had no opportunity to observe directly what was happening in their classrooms.

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