

## **An Assessment of the Availability of ICT Infrastructure for Curriculum Instruction in Public Secondary Schools in Mumias Sub-County, Kenya**

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**Abstract:** *The integration of Information and Communication Technology (ICT) into the curriculum has become a necessity worldwide. The education system does not only pursue the integration of ICT into the curriculum because of its popularity in the market system, but because of the role it is perceived to play in the changing curriculum (encourages active construction of knowledge). This paper undertakes an assessment of the availability of ICT infrastructure for curriculum instruction based on a study of public secondary schools in Mumias sub-County in Kakamega County, Kenya. The study adopted a descriptive survey design. The target population comprised head teachers, teachers and students in public secondary schools in Mumias sub-County. Schools were selected using stratified random sampling technique while students' sample size was determined using Kathuri and Pals formula. Head teachers and heads of computer departments were purposively selected. Questionnaire, structured interview schedule and content analysis were the main instruments of data collection for the study. Two sets of questionnaire were prepared, one for the students and the other for the teachers. The structured interview schedule was used to solicit information from the head teachers. Both qualitative and quantitative data were collected for the study. Qualitative data was analyzed descriptively. Analyzed data was presented in form of cumulative frequency tables, percentages and graphs. The study established that the main ICT facilities in place in most schools in Mumias sub-County were radio for interactive radio instruction and computers. The radios available in the studied secondary schools were however inadequate. A majority of the examined secondary schools had an average computer to learner ratio of 30:1. The study recommended that the Ministry of Education should hasten the development of ICT policy to ensure that teachers practice what is in line with the ministry's expectations, schools should involve their governing bodies to facilitate provision of ICT infrastructure and that concerned departments within the Ministry of Education should conduct regular and differentiated ICT teacher trainings.*

**Keywords:** *Availability, ICT Infrastructure, Curriculum Instruction, Public Secondary Schools, Mumias Sub-County, Kenya.*

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### **I. Introduction**

According to Daniels (2002), ICTs have become – within a very short time – one of the basic building blocks of modern society. Many countries now regard understanding, and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. However, there appears to be a misconception that ICTs generally refer to ‘computers and computing related activities’. This is not the case, although computers and their application play a significant role in modern information management. Other technologies and/or systems also comprise the phenomenon that is commonly regarded as ICTs. Pelgrum and Law (2003) state that towards the end of the 1980s, the term ‘computers’ was replaced by ‘IT’ (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term ‘ICT’ (Information and Communication Technology) around 1992, when e-mail started to become available to the general public (Pelgrum & Law, 2003).

According to a United Nations report (1999), ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. According to UNESCO (2002), information and communication technology (ICT) may be regarded as the combination of ‘Informatics technology’ with other related, specifically communication, technology.

The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audiocassettes and CD ROMs have been used in education for different purposes (Sharma, 2003). The field of education has been affected by ICTs, which have undoubtedly affected

teaching, learning and research (Yusuf, 2005). A great deal of research has proven the benefits of ICTs to the quality of education. ICTs have the potential to innovate, accelerate, enrich and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthen teaching and helping schools. Much has been said and reported about the impact of technology, especially computers, in education.

Initially computers were used to teach computer programming but the development of the microprocessor in the early 1970s saw the introduction of affordable microcomputers into schools at a rapid rate. Computers and applications of technology became more pervasive in society which led to a concern about the need for computing skills in everyday life. ICTs have been utilized in education ever since their inception, but they have not always been massively present. Although at that time computers have not been fully integrated in the learning of traditional subject matter, the commonly accepted rhetoric that education systems would need to prepare citizens for lifelong learning in an information society boosted interest in ICTs (Pelgrum, & Law, 2003).

The 1990s was the decade of computer communications and information access, particularly with the popularity and accessibility of internet-based services such as electronic mail and the World Wide Web (WWW). At the same time the CD-ROM became the standard for distributing packaged software (replacing the floppy disk). As a result educators became more focused on the use of the technology to improve student learning as a rationale for investment. Any discussion about the use of computer systems in schools is built upon an understanding of the link between schools, learning and computer technology. When the potential use of computers in schools was first mooted, the predominant conception was that students would be 'taught' by computers. In a sense it was considered that the computer would 'take over' the teacher's job in much the same way as a robot computer may take over a Welder's job. Collis (1989) refers to this as "a rather grim image" where "a small child sits alone with a computer".

However, the use of information and communication technologies in the Education process has been divided into two broad categories: ICTs for Education and ICTs in Education. ICTs for education refers to the development of information and communications Technology specifically for teaching/learning purposes, while the ICTs in education involves the adoption of general components of information and communication technologies in the teaching Learning process.

### **ICT Use in Curriculum Management in Schools**

The management of curriculum is an important component of school leadership and as such school leaders need to be conversant with the information required in leading their schools. Curriculum management practices that head teachers and teachers can enhance by use of ICT include curriculum delivery, timetabling, student attendance records, students contact details, preparation of schemes of work, development of lesson plans, student assessment progress records and reports, preparation of tests and examinations, allocation of teaching and learning resources, and staff performance records. Head teachers and teachers therefore need to be aware of how ICTs can benefit their management practices in order to benefit from their full potential. Harasim (2000) states that most of the available options for the effective use of ICT in curriculum delivery are much more useful when the activity is linked in a communication network that permits Internet access for e-mail, and website browsing. It is therefore imperative that every teacher is aware of the expansive opportunities that the internet provides as a tool of curriculum implementation. Global networks such as the internet provide access to online databases and archives, libraries, as well as to thousands of special interest forums on topics ranging from humanities to sciences.

### **Examination Management**

Computers are used to type exams and this is very helpful since the exams can easily be moderated through editing. Computers can also store up students' scores for all exams done while in the school, it is easy to track the academic progress of a student over time and advice him accordingly.

### **Management of Classroom Resources**

Class teachers can also manage resources in their classes using ICT. These resources include furniture, stationery and textbooks. This will assist the teacher and even the school administration to monitor the adequacy of resources in the school. ICT is particularly relevant in textbook management. It makes it easy for the teacher to know which students have been issued with which books and this makes it easy to track book losses.

### **Guidance and Counselling**

A class database can be useful for teachers because it can store all information pertaining to particulars of a student such as name, index number, address, parents, names and details, academic performance, subjects enrolled in, religion, ethnic background etc. Curran and Saunders (1992) point out that such a central database

can provide information that could assist in commenting on the progress of students and for counselling them on their social life.

### **Timetabling**

The head teacher can use ICT in order to accurately capture all subjects and their time allocation. It is important for the head teacher to keep a digital timetable containing detailed records of the academic level and experience of all members of staff so that the school can utilise all the available skills that might enhance management.

ICT networks in large schools can also be used to indicate the rooms to be used for particular subjects within the timetable. During times for optional subjects, for example, it is easy for the head teacher, teachers and students to know which subjects are done in which room. It is also easy to identify which classes should be using shared rooms like laboratories, workshops and libraries at which particular times.

### **ICT Policy in Kenya**

A national ICT policy for Kenya was adopted in January 2006 after many failed attempts in preceding years (Wiersma & Jurs, 2005; Kariuki, 2009). The policy is based on four guiding principles: infrastructure development, human resource development, stakeholder participation and appropriate policy and regulatory framework. On human resource development, the policy underscores the need to strengthen and streamline ICT training through (among others): promoting ICT in education at primary, secondary, tertiary and community levels by developing ICT curricula and ensuring that teachers/trainers possess the requisite skills, setting up a framework for evaluating and certifying ICT training programmes (Kenya Ministry of Information and Communications, 2006).

The policy further lays the framework for e-learning considered crucial to its development and utilisation. There is need to provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms; and to promote the development of content to address the educational needs of primary, secondary and tertiary institutions. The e-learning framework further seeks to facilitate sharing of e-learning resources between institutions and to exploit e-learning opportunities to offer Kenyan education programmes for export (ibid.). The realisation of these intentions is expressed in the national ICT strategy for education and training, the policy document for ICT in education (Kenya MoE, 2006). These include, among others, (1) equipping education institutions with digital equipment to stimulate integration of ICT in education and (2) supporting initiatives that provide digital equipment to educational institutions, with priority to secondary and primary schools.

The expected outcome of these measures was to improve equipping of educational institutions with digital infrastructure up to 80% in secondary schools and up to at least 10% in primary schools. The average access was expected to improve from the prevailing one computer for 150 students to one computer for at least 50 students in secondary schools. The strategy also underscored the need for access and equity by establishing mechanisms to support infrastructural development in remote areas, implementation of policy provisions that are favourable to special needs groups, and making budgetary provisions for adequate supply of ICT equipment and facilities (Kenya MoE, 2006).

### **Availability of Infrastructure to Support ICT**

To support ICT integration in schools, the whole prerequisite hardware infrastructure needs to be in place with the supporting elements such as electricity, maintenance, and technical services. It is not realistic to expect teachers, who will be struggling with a new role and pedagogy, to assume technical responsibility for the hardware. The basic requirement is appropriate rooms or buildings to house the technology. In schools that have vacant classrooms and or old school buildings, extensive renovation to ensure proper electrical wiring, heating/cooling and ventilation, and safety and security would be needed.

Another basic requirement is the availability of electricity and telephony. A good case in point is that of Swaziland in which availability of electricity at secondary schools was not a problem because all secondary schools have electricity. In most developing countries, however, the main problem is that of low telephone network and access to Internet.

### **Statement of the Problem**

This study investigated the status of ICT integration into instructional tasks in secondary schools in Mumias Sub-county. ICT integration into instructional tasks involves the use of ICT by teachers to supplement traditional methods of curriculum instruction. The use of ICTs in education is usually described under the umbrella term: e-learning.

Many schools have installed computers through various initiatives spearheaded by the government, development partners and individual schools. Most Kenyan secondary schools introduced computers in great

numbers starting early 1990s and the practice has continued to date (Makau, 1990). However, the pace of ICT use in instructional tasks in Kenyan secondary schools has not been fast enough. Secondary school teachers, particularly those in Mumias sub-County and similar regions, are still mostly rooted in the traditional instructional forms and hence they are not making the necessary effort to integrate ICT to create innovative learning experiences for their students.

During the 2<sup>nd</sup> International Conference on ICT for Development, Education and Training, popularly known as E-learning Africa, on 25<sup>th</sup> May 2007, the then Minister for Education, the late Prof. George Saitoti, said that e-learning developments and initiatives are already in the institutions at different levels and policies geared towards support to ICTs in schools are in place. He also said they had created partnership with other stakeholders in order to speed up and enhance the use of ICT in education. These include NEPAD, Microsoft, ICT Trust, Communication Commission of Kenya (CCK), Multichoice and other ministries. Significant strides in providing primary and secondary schools with needed hardware and software as well as providing training for teachers in computer skills had been done. In all these efforts, the focus has been on integrating ICT into teaching and learning.

The late former Minister's statements indicated that ICT integration initiatives are at various levels in Kenyan secondary schools. It was, therefore, timely for the study to find out the status of these initiatives by determining the nature of ICT resources available in the schools and the purpose for which they are used. The study was also motivated by a USAID report of 2005 entitled ICTs in Education Options Paper which found that despite the initiatives put in place to install ICTs in schools, most of the equipment lie unused in computer labs or are used merely for computer literacy and teaching computer studies rather than as tools for enhancing instructional leadership.

The study explored how the initiatives enlisted in the ICT integration documents such as the National ICT Strategy for Education and Training and Sessional Paper No. 1 of 2005 were being received in schools and the manner and extent to which they were being translated to practice in order to verify whether implementation is proceeding as envisaged. The study further explored the experiences of head teachers and teachers in order to find out the challenges they might be facing while using ICTs to enhance instructional leadership.

Their perceptions were sought in order to determine their attitudes towards ICT integration and how these attitudes influence the level of ICT integration practices in their schools. This was meant to unearth the factors that actually influence the effective use of ICTs as tools for managing instructions delivery of curriculum in secondary schools in Kenya.

## **II. Materials And Methods**

This study was carried out in Mumias sub-county. Mumias sub-County is located in Kakamega County in the Rift Valley, Kenya. The study adopted a descriptive survey research design. This design is also useful in identifying the standards against which the existing conditions can be compared. The survey method was chosen because the findings needed to be generalized over a large population.

The target population for the study comprised all head teachers, students and teachers in all secondary schools in Mumias sub-County. There were 31 Secondary Schools in Mumias Sub County at the time of study with a student population of 6800. The teaching staff population was 195 with 31 head teachers are (Mumias Education Office, 2013). A sample of 15 out of 50 (30%) secondary schools in Mumias sub-County was selected using random sampling technique. Head teachers and heads of computer departments were purposively selected. This gave a sample of 15 head teachers and 15 heads of computer department. Three (3) teachers were randomly selected from each school giving a sample of 45 teachers. A total of 364 students were sampled for the study. The students were selected using stratified random sampling technique. The basis of stratification was the class level of the students. The total number of respondents for this study was therefore 439.

The main data collection instruments for the study were questionnaire (students' and teachers'), structured interview schedule (head teachers'), and analysis of relevant archival materials. Both qualitative and quantitative data analyses were done. Qualitative analysis was done in the study because the research was based on an interpretive naturalistic approach as pointed out by (Johnson & Christensen, 2008). Some of the items in the questionnaire were analyzed quantitatively. Qualitative data was analyzed using frequency counts and percentages. Analyzed data was presented using cumulative frequency tables, percentages and graphs.

## **III. Results And Discussion**

The study sought to establish the availability of ICT infrastructure for curriculum instruction in the secondary schools. The findings of the study were as discussed below.

### **Availability of ICT Facilities**

A majority of the secondary schools that were studied, 9(60%), had radio for interactive radio instruction (IRI), 7(46.7%) had audio learning cassettes while 5(33.3%) had computers meant for curriculum

instruction. Only 3(20%) schools had video/TV-learning facilities. None of the secondary schools under study had electric learning boards, integrated ICT infrastructure and support application systems (SAS). These findings were as illustrated in Figure 1 below.

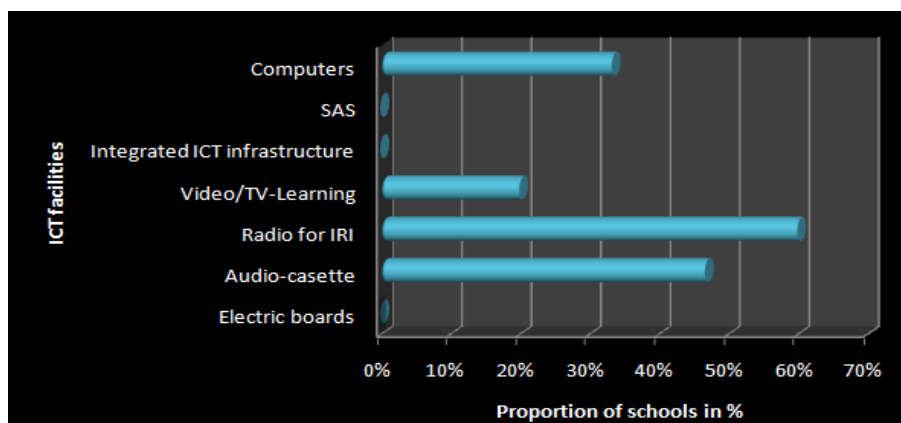


Figure 1: Availability of ICT facilities in schools.

Source: Field data, 2013

### Learner: ICT Facilities Ratio

#### Learner to Computers' Ratio

Of the 33.3% proportion of secondary schools that had installed computers for curriculum instruction, 2(13.3%) had learner to computer ratios of 30:1 each, 1(6.7%) had a learner to: computer ratio of 10:1 while the remaining 2(13.3%) had a learner to computer ratio of more than 30:1 each. These findings are presented in Figure 2 below.

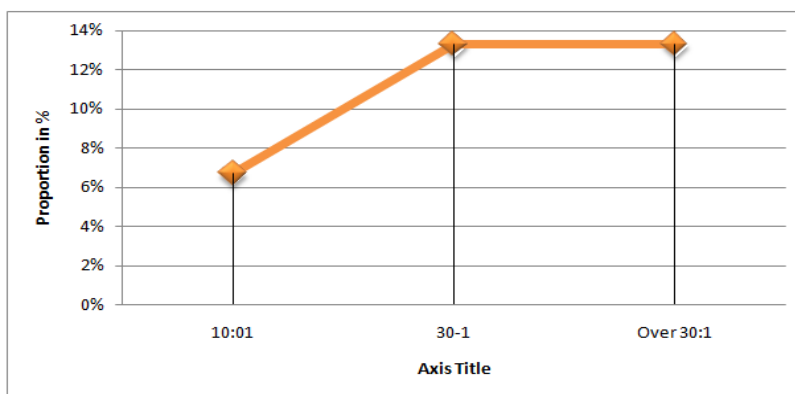


Figure 2: Learner to computer ratio.

Source: Field data, 2013

### Number of Radios available in Schools

Out of the 9(60%) schools that reported having radios for interactive radio instruction sessions, 6(40%) had only one radio each in the school, 2(13.3%) had two radios each while the remaining 1(6.7%) had three radios as illustrated in Figure 3.

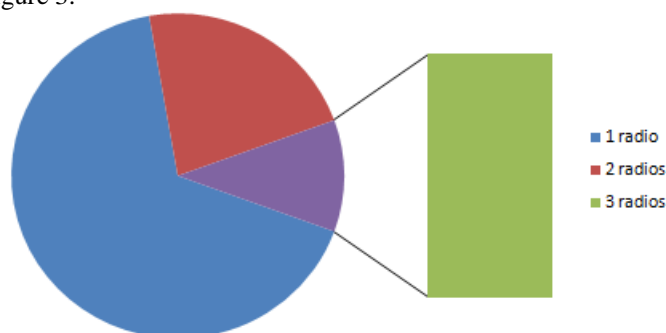


Figure 3: Number of available radios in schools

Source: Field data, 2013

This finding is in agreement with those of previous studies. In a recent study, Kiptalam et al. (2010) observe that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries.

Whereas results indicated that ICT has penetrated many sectors, including banking, transportation, communications and medical services, the Kenyan educational system seems to lag behind. Further, a recent report by the National Council for Science and Technology (2010) indicates that computer use in Kenyan classrooms is still in its early phases, and concludes that the perceptions and experiences of teachers and administrators do play an important role in the use of computers in Kenyan classrooms.

#### **IV. Conclusion And Recommendations**

The study established that the main ICT facilities in place in most schools in Mumias sub-County are radio for interactive radio instruction and computers. The radios available in the studied secondary schools are, however, inadequate. A majority of the examined secondary schools have an average computer to learner ratio of 30:1. From these conclusions, it is recommended that the Ministry of Education should: provide schools with the necessary hardware and software they need; hasten the development of ICT policy to ensure that what teachers practice in their schools is in line with what the Ministry has proposed in its policy; appoint qualified ICT education specialists at school level and conduct regular and differentiated teacher training.

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