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Adequacy of Computer Technology Resources for Teaching Mathematics in Public Secondary Schools in Nakuru Town Sub-Counties, Kenya

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Abstract

The use of Computer Technology resources helps students learn by giving abstract ideas a more perceptible form and are therefore significant for teaching Mathematics. Computer Technology resources have the means to aid in the preparation of learners by developing cognitive skills, critical thinking, information access, evaluation, and synthesizing skills. Existing literature shows that Computer Technology can enhance instruction if basic conditions of adequate provision of computer technology resources are met. This paper establishes the adequacy of computer technology resources in teaching Mathematics. It assesses the adequacy of Computer Technology resources using a descriptive research design. A sample of 10 Mathematics teachers, 10 Principals, and one CQASO was used. Questionnaires, Computer Technology Lesson Observational Tool (CTLOT) and interview schedules were the main study instruments. Data collected was analyzed and presented in, frequencies, means, percentages, and tables. Qualitative data were analyzed thematically, transcribed, organized, and reported in verbatim form. The findings show that Computer Technology resources in the Teaching of Mathematics were inadequate. The study recommends that the management of Secondary schools should provide adequate computer resources to facilitate the realization of Computer technology integration in teaching Mathematics.

Introduction

According to the SMASE report of 2008, poor performance in Mathematics in the Kenya Certificate of Secondary Education (KCSE) has been attributed to various factors including inadequate computer technology resources. The Ministry of Education (2005) reported that many efforts were enforced to promote the teaching of Mathematics hence resulting in improved performance by solving perennial problems inherent in the subject. These include the introduction of the use of scientific calculators for

instruction and also in the examination of candidates at KCSE. However, the Kenya National Examination Council (KNEC) (2008) noted that the problem of poor performance in Mathematics continues to persist. Thus, educators have been exploring different strategies and approaches to improve the quality of education and the overall learning processes for many years.

There is a growing demand for educational institutions to use computer technology resources to teach the skills and knowledge students need for the 21st century (Schindler *et al.*, 2017; Kiprono, 2019). Realising the remarkable importance of computer technology resources in education, educational institutions attempt to restructure their curricula and teaching facilities to include them. Costley (2014) has documented the huge benefits that computer technology resources bring to teaching. For instance, calculus students who used Mathematics software were able to solve problems requiring calculus more conceptually and make connections between numerical, graphical, and symbolic representations as compared to students learning via traditional methods such as lecture method, historical method, books, and pencil exercises and teacher-centred teaching (Monyoro, 2013).

In today's classrooms, computer technology resources are apparent in various forms, from mobile labs to interactive videos, computers, smartphones, iPads, iPods, tablets, shared stories, and electronic blackboards. Using computer technology resources is seen as a powerful and realistic tool for classroom teaching in that it helps make teachers' work easier and more efficient (Pelgrum, 2001; Kozma & Anderson, 2002; Makau, 1990).

Kaput (2007) notes that advanced tools are necessary as they help students learn by supporting computation and giving abstract ideas a more perceptible form. Computer Technology applications are the right substantial form for secondary school. Computer Technology can support learning when appropriately used with teaching techniques, curriculum, and assessments (Means & Haertel, 2004).

Research Methods

This study employed descriptive design to obtain data on factors that affect the use of Computer Technology resources in teaching Mathematics. The qualitative data were statistically analysed to describe trends in responses to questions. The study population comprised 25 principals, 60 Mathematics teachers, and 1 CQASO from 25 public secondary schools. The sample size for the study involved 10 principals, 10 SMASE-trained Mathematic teachers, and 1 County Quality Assurance and Standard Officer (CQASO), forming 24.4% of the study population. Kothari (2014) recommends that for a population larger than 1000, a sample of 30% is acceptable. However, for a population less than 1000, 20 % is adequate to form a representation of the sample. This study determined the relationship between the dependent variable, the use of Computer Technology, and the independent variable, computer Technology resources. The researcher employed purposive sampling techniques based on teachers who had trained with SMASE and were all included in the sample. Those not trained with SMASE were excluded.

Adequacy of Computer Technology Resources used in teaching mathematics

The Computer Technology resource variable was assigned the following values during analysis: Very Adequate (VA =4), Adequate (A = 3), Inadequate (I =2), and Very Inadequate (VI = 1). The total scores and mean scores obtained by individual Teacher respondents were computed concerning Computer Technology resources. Total scores were obtained by adding the scores of the individual respondent on each item and then dividing them by the total number of items to get the individual mean scores.

Table 1 has information on Computer Technology resources as given by individual teacher respondents in their respective schools. computer technology resources (computer laboratory, mathematics computer software computer hardware LCD projector, computer technicians, and internet) in teaching Mathematics in secondary schools in the Nakuru Town sub-county. They were expected to rate as either very adequate, adequate inadequate, or not available. Responses of principals on the listed computer technology resources were as shown in Table 1.

Table 1: Computer Technology Resources Used in teaching mathematics

Teacher S. No.	LCD projector	Computer software	Computer application	Computer Hardware	Mathematics teachers	Technicians	Internet access	Total Score	Mean Score
1	1	2	2	2	2	3	3	15	2.14
2	1	1	2	2	2	1	1	10	1.43
3	1	1	1	1	2	4	2	12	1.71
4	4	3	2	2	3	3	2	19	2.71
5	2	2	2	2	3	3	3	17	2.43
6	3	2	2	3	2	3	2	17	2.43
7	2	2	2	2	2	3	3	16	2.29
8	3	3	2	3	3	3	3	21	3.00
9	3	2	2	2	3	4	4	20	2.86
10	2	2	1	3	3	4	2	17	2.43
Overall mean score									**2.1**

The finding, which is presented in Table 1, indicated that resources such as Computer laboratories, Hardware, and Computer software were inadequate, with responses from 2 (20%) teachers, 5 (50%) teachers, and 6 (60%) teachers, respectively. It was noted that 7 (70%) teachers reported that LCD projectors are inadequate, but only two teachers reported them to be adequate. Regarding computer technicians, it was reported that they were unavailable and only 1 (10%) teacher reported that the internet was adequate. This finding indicates that Computer Technology resources were inadequate, as indicated in Table 2.

Table 2: Adequacy of the Computer Technology Resources

Computer Technology Resource	VA (4) F	A (3) F	I (2) F	VI (1) F	Total Score	Mean Score
Internet access	1	3	4	3	20.00	3.33
Computer Technology Technicians	1	2	4	3	21.00	2.10
Mathematics Teachers	1	0	6	3	19.00	2.7
Computer Hardware	0	3	3	4	19.00	3.16
Computer applications	1	2	4	3	21.00	2.10
Computer software	1	2	3	4	20.00	2.00
LCD projector	1	3	2	4	21.00	2.1
Overall mean						**1.75**

Key: Very Adequate (VA)= 4; Adequate(A)= 3; Inadequate(I) = 2; Very Inadequate (VI)= 1; f=frequency of teachers

The quality Assurance and Standards officer of Nakuru County was asked to rate the adequacy of computer technology resources in Nakuru Town sub-county secondary schools. He responded that: There are few resources and insecurity of Computer Technology related materials in schools that have them. CQASO's sentiments support an earlier study carried out in the same county in Kinuthia (2012), where 72.73 of the principals reported that the use of ICT in secondary schools was inadequate, partly because of installation costs and more so costs frequently incurred in hiring technical services and updating of computer software and other accessories. In the same study, 78.57% of teachers rated ICT facilities as inadequate for all subjects. It was therefore established that computer technology resources are inadequate for teaching mathematics.

On the frequency of using computer technology in teaching Mathematics, Mathematic teachers were asked to indicate how often they use computer technology in teaching Mathematics. The results were as presented in Table 3.

Table 3: Frequency Using Computer Technology in Teaching Mathematics

Statement	**Very often**	**Often**	**Rare**	**Very rare**	**Never**
How often do you use computer Technology in Teaching Mathematics	0 0.0%	2 20.0%	3 30.0%	5 50.0%	0 0.0%

Key: %=Percentages

It was observed that 80% reported that they rarely use computer Technology in teaching Mathematics. It can be argued that perhaps teachers had challenges that hindered them in the use of computers in teaching. Regarding factors inhibiting the use of computer technology in the teaching of Mathematics, Mathematics Teachers were asked to state factors that inhibit them in the use of computer technology in the teaching of Mathematics. They gave their views as follows: inadequacy of facilities such as

projectors, computers, and internet connectivity (81.2%), lack of computer skills and ICT support services (67.3%), inadequate time (57.14%), and that some content cannot be taught using technology (56.8).

Discussion

The overall mean for teachers' using Computer Technology in teaching mathematics in the classroom was low**.** This finding agrees with Kuvuuka (2013), " that using computer technology in teaching is complex; hence one can encounter many challenges. Many factors affecting the use of computer technology in schools have been revealed, resulting in minimal use, leading to teachers' capability deprivation to deliver the curriculum effectively and to receive quality education using computer technology.

Generally, the respondent's response on computer technology resources indicated that these resources were Inadequate and that an adequate Computer Technological resource is ideal for using computer technology resources in teaching. Current educational reforms aim at using Computer instructional technology to support active student learning and quality teaching.

Adequate Computer Technology Resources improve the use of Computer Technology in teaching Mathematics. It can be observed that all computer-based resources are vital in using Computer technology in teaching, and its decline may affect technological advancement in teaching. This finding agrees with Gulbahar (2008), who stated that the inadequacy of Computer Technological resources is one factor that greatly influences teachers' effective use of Computer technology. Equally, Egbert, Paulis, and Nakamichi (2002) concluded that lack of time, support, and computer technological resources barred the use of technology by teachers in their teaching.

Computer technology resources available for mathematics teaching was generally inadequate in schools. This revelation implies that a shortage of these resources could hinder the use of Computer Technology in teaching Mathematics in secondary schools. This finding concurs with Gulbahar (2008), which revealed that computer technology facilities are a major challenge facing most African countries, with one computer to 150 students against the ratio of 1:15 students in the developed countries. Technologies that provide access to information through telecommunications includes; televisions, radios, satellite, the Internet, wireless networks, cell phones, and other communication mediums. Computer Technology applications like PowerPoint and Excel were used in lesson presentations. The finding of the analysis shows clearly that resources such as internet access Computer Hardware and Computer software were inadequate, also human resources, technicians, and teachers. This finding, therefore, indicates that adequate Computer Technology resources affect the use of computers in teaching Mathematics. Based on this study, when there are adequate Computer Technology Resources, the use of Computer Technology in teaching Mathematics improves.

Conclusion

The study's findings clearly show that resources such as internet access, computer hardware and computer software were inadequate, as reported by 81.2% of teachers. It was noted that a few schools (30%) had LCD projectors and Computer application e.g. Powerpoint, excel, word process while others were in the process of acquiring them. Regarding human resource, technicians and computer teachers were inadequate with only 28% of teachers using computer technologies in their schools. It

was established that many mathematics teachers were not trained to handle ICT in mathematics teaching. The study concluded that training the teachers in ICT was required to equip them with skills to integrate technology into mathematics teaching. The Ministry of Education should provide adequate school infrastructure to enable teachers to use modern technologies in teaching all subjects.

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