European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.1442789 Volume 5 | Issue 1 | 2018

ASSESSMENT OF THE CHALLENGES FACING THE USE OF COMPUTER AIDED MATHEMATICS INSTRUCTION IN SECONDARY SCHOOLS KOIBATEK SUB COUNTY, KENYA

Chalo John,
Paschal Wambiya,
Shem Mwalw'a[i]
PhD candidate,
Catholic University of Eastern Africa,
P.O Box 62157, Nairobi, Kenya

Abstract:
Computer aided mathematics instruction is usually incorporated into instructional resources in high schools. Its introduction in high schools in Kenya has allowed the users to perform increasing complex functions. The problem is the mathematics instructional abilities that have not yet currently appeared within the students yet during the learning process. This research examined and identified types and the teacher's ability to use the computer-aided instructional resources used in mathematics instruction in Koibatek Sub County. The mixed embedded concurrent design was used. The quantitative method was the main method while the qualitative method becomes the secondary method. The probability and non-probability sampling techniques was used to select the respondents. Two research questions were designed to be answered and one hypothesis. The data collection tools involved concurrent qualitative and quantitative instruments which were questionnaires, interview guide and observation guide. The data collected was used to identify the challenges and their solutions. Inferential statistics was used to analyze quantitative data, while the qualitative data was analyzed descriptively to support, clarify and simplify the results of the quantitative analysis. This was done mainly by organizing the descriptive data into themes, pattern-matching and discussed in depth. The results of the findings pointed that there were several problems involving teachers, students and availability of the instructional resources. The researchers suggested that teachers be given more training in computer technology and the computer aided method of instruction be made compulsory in the secondary school mathematics and other subject's instruction. The ministry of Education in Kenya needs to introduce professional development programs in education system for practicing teachers to enable them acquire relevant skills and

[i] Correspondence: email jchalo61@yahoo.com, pwambiya@cuea.edu, smwalwa@cuea.edu

Copyright © The Author(s). All Rights Reserved.
© 2015 – 2018 Open Access Publishing Group

knowledge to be used in the incorporation of computer technology into mathematics instruction.

Keywords: assessment, challenges, curb, computer aided mathematics, secondary schools, Koibatek Sub County, Kenya

1. Introduction

Mathematics instructional process at present is dynamic and facing changes and continuous improvement. However there are challenges which include the choice and use of the appropriate instructional resources and the arousing of students interests and attitude towards the subject taught. (The changes have resulted from the improvement in the information technology, the use of face book, internet services, short text message services documentaries, video shows, television programs, e-learning, Itabs, I pads and computer conference learning has shifted the interest of the youth who are of the secondary school going age who are more interested in new innovation than listening to the radio instructional lessons and other classrooms institutional resources.) The instruction process is moving towards digital (the use of computers) for the reason of the increasing generation of learners growing up interacting with digital technology (Presnky, 2008) that would like to have fun and interesting activities during mathematics learning processes.

Computer aided technology instruction today has become an important part of modern learning. Its effect can be felt almost everywhere or in any domain of human activities. In areas of education, the application of computer technology is being integrated in students' learning activities both in and out of classrooms. The common used technologies by students in schools include the computer aided instruction media and the Internet services (Langton, Manwaring, Fry, West, & West, 2015). It can be commented that today's students will witness even more new technologies in their learning activities in the years to come. While computer aided instructional technology is mostly used in today's classes and many schools are ready to make more investment in modernizing their classrooms, the need to clearly and understand the effect of computer aided technology on students 'learning has become even more important and urgent. Of particular importance are questions that ask: (a) what computer technologies are being used by students during their learning? (b) How do teachers use computer technology in their teaching activities? (c) How do students feel about the use of computer technology, or, in other words, do they find computer technology truly arousing their learning experiences? (d) Is computer aided technology used in the same ways by teachers from different areas or countries or by students of different genders? Responses to these questions will help guide our educational practices regarding the use of computer technology in the classroom and will influence the education decisions of our schools (Langton, Manwaring, Fry and West, 2015).

Mathematics learning in school doesn't solely aim to create students perceive the topic content, there are varied objectives like rising the mathematics reasoning ability,

the mathematics communication ability, the association of mathematics, the mathematics illustration, and also the resolution of sums in mathematics, similarly as some specific behaviours that should be internalized by students once they studied mathematics (Taylor & Francis 2013). The mathematics tutorial ability is extremely vital for the scholars in order that they will solve mathematics issues by using sensible reasoning, illustrating the mathematics concepts into an arithmetic model, and then connect the method into varied ideas, into existence context, similarly as different disciplines.

Mathematics subject is done by all students in the Kenya high school's curriculum. Its teaching requires continuous practice, interaction, experiment, formal lecture, listening and visual skills in order for learners to score high grades in the subject. The mathematics instructional activities in secondary schools can be greatly improved when regular instructional materials and resources are combined with the computer aided mathematics instruction (National Council of Mathematics Teachers 2000). The same report added that technology is needed in mathematics instruction; it enhances the students' interest and concentration. The Kenya Government has made great effort to provide computers to schools to assist in the teaching of computer subject. The Government donated computers to five schools in Koibatek Sub County. The question is, are these computers used in mathematics instruction or in teaching computer as a subject (Koibatek Sub County Education Office, 2017).

The assessment of the challenges facing the use of computer aided mathematics instructions in public high schools will look at the incorporation of computer technology into mathematics instruction by identifying the instruction materials used in schools. The study will look at the availability and types of computer technology resource used in mathematics instruction in Koibatek Sub County such as the production in the computer of projected charts, construction diagrams, models, revision materials, mathematics programs, use of internet and power point projection, the challenges facing their use and ways to curb the challenges.

2. Statement of the Problem

There has been a concern internationally and in Kenya that learner's achievement in mathematics is poorer than in any other subject and particularly in high schools. The problem is compounded by the inability of many schools to afford ICT materials and ignorance of the majority of teachers to use them (Koibatek Sub County Education office 2017). Many scholars have given reasons for the weak performance in mathematics by the learners in secondary schools. For example, Presnky (2008), Tapscott (2009) and Spenger (2010) said that technology has affects the way today's students learn. The use and access to technology vary greatly among school environments. The problem is that inadequate of access to and use of computer technology in mathematics instruction is making learners to be at a disadvantage and not meeting the educational needs of today's students. This has prompted the researchers to carry out this study in Kenya Secondary Schools. Specifically, the study

answers the question, what are the challenges facing the use of computer-aided mathematics instruction in secondary schools and the ways to curb the challenges in Koibatek Sub County, Kenya? The arithmetic communication ability has not presently appeared among the students nevertheless throughout the educational process. Thus, they have an inclination to administer up problem solving once they experience difficulties in mathematics the task. This study is predicted to be a reference and discourse for practitioners of arithmetic education to grasp a lot of concerning the role of computer-based arithmetic instruction in raising the arithmetic communication ability.

2.1 Purpose/Objectives of the Study

The purpose of the research was to assess the challenges facing the use of computer aided mathematics instruction in secondary schools in Koibatek Sub County Kenya (1) To establish the problems/challenges encountered by the teachers and students when using the computer aided mathematics instruction. (2) To advise ways to curb the challenges faced when using the computer aided mathematics instruction.

2.2 Hypothesis

There is a relationship between the use of computer aided mathematics instruction and different teacher respondents characteristics such as gender, teacher experience, age brackets and highest qualification.

3. Significance of the Study

The findings of this research was to influence appropriately the Government education agencies and school systems to fund the areas of professional development and technology instruction resources, materials and to utilize of public funds appropriately in relevant and modern instruction technology. The results can influence and help to boost the county education standards by selecting the instruction media resources that make interest on students' hands on activities so raising students' mental retention and learner's accomplishment. The Government education agencies will be guided on the choosing of curriculum, the inclusion of the appropriate instruction material, resource and technology to rethink present technology policies and guidelines. Those in charge of education will need to identify ways to tie instruction to the dynamic changing technologies available to today's learners. It is the responsibility of educators to prepare learners for the outside world including technological use.

The research findings and recommendations was to use to assist the teachers of Mathematics in secondary schools in Kenya to effectively choose and use the appropriate resource, materials and technology in Mathematics instruction. The researchers were to recommend to the ministry of education on receiving the report to communicate to the inspectorate, the quality assurance and standards officers on how to advice the teachers of mathematics in order to improve teachers mathematics communication. It was hoped that it was to provide useful information to Kenya

Institute of Curriculum Development (KICD), which prepares the secondary schools mathematics syllabus on good teaching practices and appropriate uses of instructional materials, resources, and incorporate computer aided instruction.

3.1 Scope and Delimitation of the Study

The research was conducted in Koibatek Sub County, Kenya. The findings should be generalized to other areas with caution. The study was restricted to secondary schools in the Sub County. The research was confined to mathematics teachers and forms three students in public secondary schools. The research was looking at the challenges facing the use of computer-aided mathematics instructions. The computer-aided instructional materials include the use of computer technology, access to the internet, chatting on the web, use of CDS and USB loaded with software, programs for teaching and learning mathematics and ways to curb the challenges.

4. Methodology

4.1 Research Design

This is a mixed research design study which is specifically embedded concurrent design (Creswell, 2012).In this mixed method; the quantitative method become the primary method while the qualitative method become the secondary method. The method was aimed at simultaneously collecting, merging and using both quantitative and qualitative data. It was accomplished using a pattern-matching technique where several pieces of information collected from the respondents were related to the theoretical proposition, that is, the challenges facing the use of computer aided mathematics instruction and ways to curb the challenges. The qualitative research approach was taken because it allows in-depth investigation of thoughts and processes of participants which enable the researcher to suggest recommendations on how to make secondary school mathematics instruction more effective.

4.2 Target Population, Sampling Design and Sample Size

The population included all students from twenty-one secondary schools in, Koibatek Sub County, all mathematics teachers and head of the department. The rationale of the three parties' participants is because they are involved in the computer aided mathematics instruction. The parties include students who learn using the computer aided instruction, teachers who use it in mathematics instruction and schools managers who provide for the infrastructure depending on the nature of schools.

Probability and non-probability techniques of sampling were used since the study is a mixed study design. The samples were a third of the secondary schools, students and mathematics teachers from Koibatek Sub County. There are twenty-one secondary schools in the sub-county; therefore, seven schools participated in the research. There is one national school, seven provincial schools, and thirteen Sub County schools. The figure below represents diagrammatic explanation of the sampling decision that was required in this study.

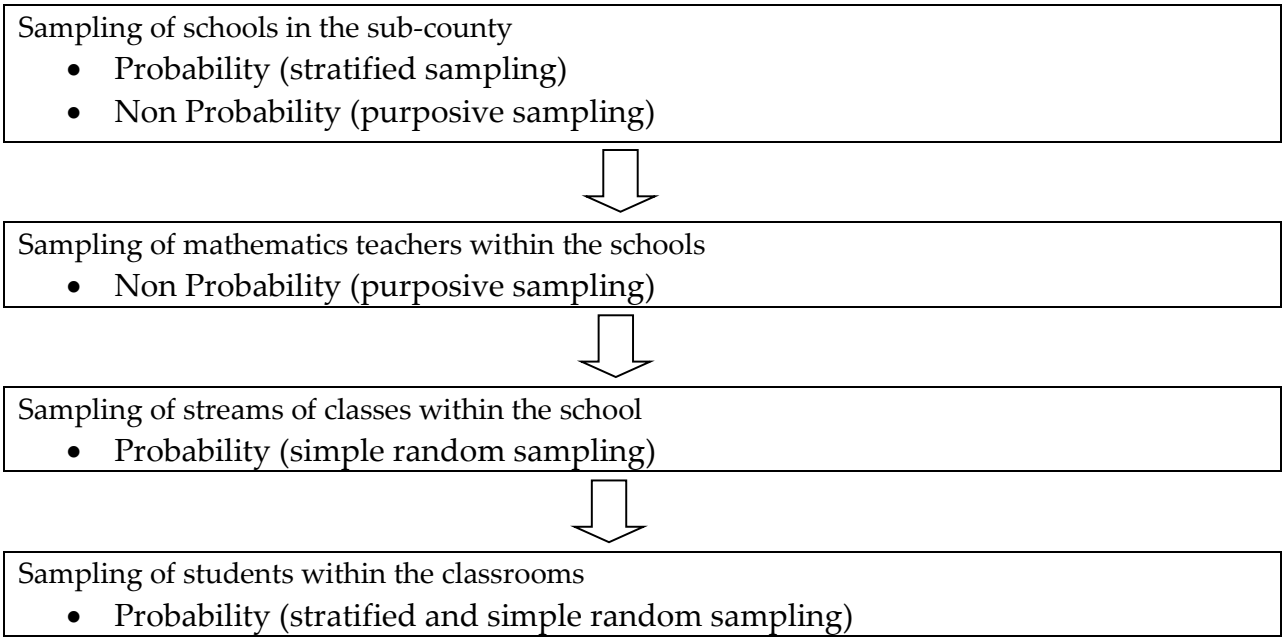

Figure 1: An illustration of multilevel mixed methods sampling in Koibatek Education setting

(Adopted from: European University Institute Library November 27, 2009)

Figure 1 shows an illustration of a multilevel sampling which was used since the study is a mixed study design. The sampling method that was used in sampling seven schools out of the twenty one was the stratified sampling and the purposive sampling techniques. Teachers were selected using the purposive sampling technique which is a non-probability. The streams of classes within the schools were selected using the simple random sampling technique in case of schools with more than one stream. The student's respondents were selected using the stratified sampling technique in case of mixed schools followed by simple random sampling. The rationale of using the multilevel sampling technique is because of the use of the mixed research design.

4.3 Description of Data Collection Instruments

The data collection tools are sequential designed with mixed qualitative and quantitative data items. The data was collected from the observation guide, open and closed-ended questionnaires for students and teachers, the 2016 K.C.S.E. mathematics results comparing the students' performance of those taught using the appropriate instructional resources, materials and incorporating computer-aided mathematics instruction and those taught using the talk chalk method. An interview guide was used for collecting data from the heads of the mathematics departments of the sampled schools. Instruments for precise target groups are described inside the next sub titles.

4.4 Questionnaire for Students

The student's questionnaire has mixed qualitative and quantitative research questions that focus on the concept of availability and use of instructional resources and materials in mathematics instructions (teaching and learning) in their class. The first a part of the

questionnaire was geared toward seeking the demographic characteristics of the students.

The second part was aimed at seeking to find out the challenges that students encounter during the use of computer aided mathematics instruction media.

4.5 Questionnaires for Mathematics Teachers

The teacher's questionnaire was also a fully mixed sequential equal status design type with mixed qualitative and quantitative research questions. The first part was aimed at seeking the demographic characteristics of the teachers. The second part deled with the teaching and learning factors in schools. The form deliberately cantered on the idea of ability as an identification of a respondent's capability to hold out a selected task; instead of specializing in the enactment itself. Hence the stem was, "I am able to use technology to…", and "I am able to..." (For scale 2). Such an approach assumes that the respondent's ability might be either potential or effective. Taking the latent approach to ability left open the chance that the declared capability may not have been enacted for varied reasons. The "I am ready instead of "what I do in the classroom" approach can have 2 obvious advantages over simply listing skills. First, it enabled the instrument to gather information on either potential or effective ability. The questionnaires for teachers from each of the sampled school in the sub-county contain open-ended and closed-ended items. The details of the questionnaire are presented in the appendix. Question 1 of the second part is aimed at seeking information on the types of instructional materials and resources used in each school, whether computer technology had been integrated into the mathematics instruction, how each of the instructional resources was used and the benefits of the instructional resources. Question 2 of the second part had item questions which the respondents had to tick (√) from the choices offered from any of the five weights on the scale ranging from (always, more often, often, less often, and not at all) with scores from ,4, 3, 2, 1, 0 respectively on the teacher's use of mathematics instructional materials and resources. Question 3 of the second part of the teachers' questionnaire had 10 items questions which the respondents had to tick from choices, more able, able, less able, not able on the teachers' ability to use technology in mathematics instruction content and pedagogy with scores 3, 2, 1, 0. This part had an open ended question which was aimed at soliciting additional information that can assist to improve the use of computer aided mathematics instructional materials, the challenges facing the use of computer aided mathematics instruction and possible ways to curb the challenges.

The method of analysis will be by obtaining the sum totals, mean and frequency. The frequency will be used to describe the characteristics of the respondents which are to compare the age, experience and teacher qualification with other variables such as the availability and ability of teachers in using computer-aided mathematics instruction, the challenges facing the use of computer aided mathematics instruction and possible ways to curb the challenges.

The method that will be used to analyze was the descriptive method, which deals with Teaching and Learning activities that can be aroused and enhanced by the instructional material and resources by indicating the skills and the topics in the description. The researchers come up with tables, matrix and flow charts which indicate the type of resources and the enhancement of the Learning /Teaching activities.

4.6 Interview Guide for Heads of Mathematics Departments

Heads of mathematics departments from each of the sampled schools were interviewed. The interview guide was a qualitative type. Notes were taken on the availability or absence of the use of mathematics instruction resource, materials, and integration of computer-aided mathematics instruction. The interview guide is presented in the Appendix. A time interval of between forty-five to sixty minutes was dedicated to each interview.

The interview guide consists of six questions. The introduction part of it starts by asking the consent of the respondent followed by the questions to which the respondents were asked to respond. In the interview guide, question 1(a), (b) and (c) was aimed at finding out the types of computer aided mathematics resources that are found in schools, which one of them promotes students' performance in mathematics and whether the mathematics teachers had attended any in-service training for mathematics instruction respectively.

Question 2 of the interview aimed at finding out how the computer aided mathematics instructional resource is used in during the mathematics lesson. The other questions 3, 4, 5 and 6 solicited information on the benefits, challenges that the students face, ways to curb the challenges and the influence of computer aided instruction on student's academic performance respectively.

4.7 Observation Checklist

The researcher observed mathematics lessons in progress and scored against a checklist of the requisite instructional materials and resources used by the teachers. The checklist is intended to verify the actual activities of the teachers in class. The lesson observation checklist is of a qualitative type that has the introduction and two other parts. The introductory part has the name of the school, Subject, Date, Lesson, Time, Topic and Roll. Part I has the check list of the Mathematics instruction class. The researcher had to observe and note the types of resources used in mathematics instruction. Part 11 has comments on the practical use of the mathematics instruction resource, material and the practical use in the classroom of computer-aided mathematics instruction.

4.8 Validity and Reliability of Instruments

Validity refers to the degree to which results obtained from the analysis of the information really represents the development under study (Mugenda, 2010).It is concerned with soundness and the effectiveness of the measuring instrument. The researcher will measure the validity of the instruments by conducting a pilot study in three schools of the neighbouring sub-county of Mogotio, with three head teachers, six

mathematics teachers, and twenty students. This will represent an above average of 10 percent of the sample size as recommended by Mugenda & Mugenda (2010) that the pre-test sample can be between 1 to 10 percent depending on the sample size. The schools involved in the pilot study won't participate in the final study. The pilot result will help to check whether the respondents will understand the question and deal with the confusion over any of the phrases in the research instruments. Secondly, the research question items in the questionnaire were corrected by research experts in and out of CUEA who assisted in checking for any ambiguity in the questions and finally they confirmed that the items in the research instruments addressed the research objectives. One member of the English Language Department and two from research department who are specialists in research from the University (the research supervisors) assisted in determining the clarity of the questions items in the research data collection tools. Their suggestions and comments were used to modify the research instruments. The researcher had structured the items in the questionnaire and interview guides and presented them in the appropriate sequence so as to improve their face validity.

Freik and Howard, (2000) defined reliability as the consistency of scores and other assessment results from one assessment to another. He also said that the synonyms for reliability are dependability, stability, consistency, reproductively, predictability and lack of distortion. In summary reliability is defined as the consistency or stability of the measuring instruments reliability is the degree to which the research instruments consistently measure whatever it is measuring (Amin, 2005). Reliability of the instruments will be assessed using test-retest method in the pilot study. Piloting will be done at Emining secondary school, Mogotio secondary school and Rosoga secondary school in Mogotio Sub County, Baringo County. The test-retest split half method was used because the data collection instruments contain open ended and close ended items which were used to measure the reliability index. The research data collection instruments; the research questions were administered first to the pilot group the first round, and then the same questions items were shifted then administered again to the same group after two weeks. The two sets of responses were correlated to determine the internal consistency of the two set of scores using the Pearson's product moment correlation co-efficient (r). The argument for the use of this formula is that the closer the correlation co-efficient value is to +1.00, the stronger the correlation that is 0 to 0.5 is a weak correlation and of 0.6 to 1 is positive strong positive correlation. (Mugenda and Mugenda, 2003).The reliability index for this study was 0.72 for the questionnaire items respectively. The calculated correlation coefficient is illustrated as shown below.

Reliability coefficient index of the research instruments using the Pearson product-moment correlation coefficient.

	Descriptive statistics		
	Mean	**Std. Deviation**	**N**
Pilot 1	7.56	4.54	40
Pilot 2	6.48	5.23	40

	Correlation	Pilot 1	Pilot 2
Pilot 1	Pearson's correlation significance (two-tailed)	1	.72
Pilot 2	Pearson's correlation significance (two-tailed)	.72	1
	N	40	40

Correlation is significant at the 0.01 level (two-tailed).

The calculated reliability coefficient of 0.72 is regarded as strong positive reliability index. The high correlation coefficient points that the research data collection tools were reliable.

4.9 Data Analysis Procedure

Data structured from the questionnaires was edited for completeness and consistency before processing it. Data was coded to enable the respondents to be grouped into categories. Descriptive statistics was used to summarize the data to enable the researcher to meaningfully describe the distribution of scores or measurements using different statistical types depending on the type of variables in the research and the scales of measurements. This was done using the correlation techniques which was used to show the relationship between variables, correlation, and coefficient ranging from -1 to 1.

The observation and interview were audio-video taped then transcribed and subsequently analyzed by the researcher and two assistants. The analysis was guided by the ideas of qualitative content analysis and was address the following themes; the mathematics practicing teacher's general views about the use of instructional materials and resources incorporating computer-aided mathematics instruction; the learning environment versus the traditional learning environment and teacher view on the use of power point in mathematics instructions. The reliability of the interview analysis was checked against the researcher and the two assistants coding. The consistency of the coding was determined by the formula (P=Na/ (Na+Nd)) given by Peck et al (2010). P is the percentage of consistency; Na is the consistency amount, and Nd is the inconsistency amount. The P value was 0.8 which implied that it was a reliable consistency. In the Technological and pedagogical content knowledge, the mean and standard deviation for T.P.C.K will be used in the survey. The regression equation showing the predicted results on the relationship between the student's performance and the variables use of computer technology and other respondent's characteristics will be shown.

5. Summary of Findings, Conclusions and Recommendations

5.1 The problems/Challenges Facing the use of Computer aided Mathematics Instruction and Ways to Curb them

The students and teachers who use computer technology in mathematics instruction conceded that they face several challenges. The following were the responses on the challenges they face.

Table 1 shows the frequencies and percentages of students and teachers responses on the challenges facing the use of computer aided instruction. The table has two parts the student's responses and the teacher's responses. It also has the frequencies and percentage in both sides. The students responded that, they were experiencing problems in computer operation, computer breakdown and fluctuation of electric supply, errors in computation, computer virus problem and inadequate computers. On the other hand teachers had the following challenges. They said that they had inadequate skills required in computer operation; there was compromise of class control for student's excitement, the use of computer instruction could cause visual problem, the method of instruction could lead to teacher cantered and there was inadequate computers and laboratories.

Table 1: Frequencies and Percentages of the Students and Teachers Responses on the Challenges Facing the use of Computer Aided Instruction

Students responses	Frequencies	Percentage	Teachers responses	Frequencies	Percentage
Inadequate computer operation knowledge	59	42.5%	Inadequate required skills and illiteracy of computer operation	6	54.54%
Computer breakdown and fluctuating electric supply	22	14.8%	Compromise of class control for students excitement	5	45.45%
Errors in computation	8	6.08%	Cause of visual problem	3	27.27%
Computer virus problem	22	14.8%	Lead to teacher centred method of instruction	2	18.18%
Inadequate computers	61	44%	Inadequate computers, software's and computer laboratories	6	54.54%
Totals n=140			**Totals n=11**		

From the onset it is noted that majority of the teachers who use computer technology in mathematics instruction consent that they have inadequate; computers, mathematics software's, computer laboratories, required skills and illiteracy of computer operation 54.54%. Other teachers complained of class control problem, visual problem among students and leading to teacher centred method of instruction with 45.45%, 27.27% and 18.18% respectively.

The student's main complaint was on inadequate computers 44%. Others complained of inadequate computer operation knowledge, computer breakdown and fluctuation of electricity supply, errors in computation and computer virus problem with 42.5%, 14.8%, 6.08% and 14.8% respectively.

The researcher observed that majority of the teachers 7 out of the 11 teachers who used computer technology in mathematics instruction showed a mastery of knowledge in the use of computers. Others could not manipulate the computers freely and easily.

The next part is aimed at answering research question (V) part (b) which seeks to recommend ways to curb the challenges facing the use of computer aided mathematics instruction. The teachers gave the following responses as way to curb the challenges; ensure power connection and power supply backups, proper training and in-service for teachers, supply schools with computers, teachers to extent their time in planning and have adequate mathematics software. The responses from teachers indicate a need for more specialized training in the use of computer technology in Mathematics instruction.

The required training seems to be relevant to identifying applications for each computer technology. Mathematics instructional use .For example a respondent remarked. "There are many tools emerging that we could use to assist our students 'learning that I often feel overwhelmed. Which one can I use? Where can I get help?" In particular, training should support the needs of those having graduated a long time ago, which exacerbates professional development needs." I need training in using a lot of technology in Math. I went through school and university without touching a computer". "I finished university 'pre computer' age and don't seem to have been given the time or training to gain adequate skills in the use of computer technology". Interestingly to supplement skilled ability some teachers resorted to totally different individual initiatives, like buying their own ICT instrumentation to advance their skills. More significantly, a number of teachers reached the stage wherever getting ICT skills in teaching had become a developmental and ongoing process. "Presently I'm making an attempt to catch up to others by doing courses. It all takes time!" "I'm presently making an attempt to upgrade my skills within the space of ICT. Our school uses in service course coaching and that I would place myself down as intermediate user however just past beginner!" Hence in–school support to integrate computer technology into mathematics instruction is essential, preferably making use of collaborative approach such as peer mentoring , peer coaching, action research, and professional discussion by teachers is necessary (Clark,2008).

The result also indicated that barriers which need more attention such as technology availability, are major concerns that impact both student and teacher use of computer technology in Mathematics instruction in Koibatek Sub County.

Equipment availableness, over any issue, appears to possess the best impact on whether or not technology was incorporated into classroom instruction. Teacher knowledge and skills, although a concern, was not the teacher first consideration, some of other factors impacted whether teachers used the computer technology were evident in the response about whether teachers used technology. Equipment availability,

instructional time schedules, and curriculum concerns were all concerns that both teacher and student technology usage.

The report on lesson observation indicate that class activities especially the interaction between teachers and students were motivating. The researcher observed that learning materials such as the computer hardware and software's were not adequately available in three out of the seven schools visited. The entire behavior of the students was not uniform for all students. Some of the classes were tense especially those which had inadequate computer technology facilities while others interacted freely especially those which had and used the computer labs for their mathematics computer lessons

There were computer labs in four schools where the students attended their mathematics practical lessons. Teachers used the overhead projectors for demonstration illustration, and problem solving. They were also able to see the student's confusion and assisted them to understand mathematics in different ways. All the schools that the research visited were connected to either single phase or three phase electricity. The time allocated to a single 40 minute mathematics lesson was inadequate as compared to the double lesson 80 minutes lesson. This was evidenced by the teachers not completing their lesson plan content during the single lesson. The four schools which had and used the computer labs for their mathematics practical lessons were connected to the internet services. In one occasion, students switched onto the internet program instead of engaging on the mathematics lesson following activities. The space in the computer rooms was not enough. The size of the rooms was small to accommodate the large number of students per stream with an average of 45 students. A single teacher was not adequate to attend to all the students during the interaction of the lesson. The computer aided mathematics instruction software commonly use in the schools were the geogebra, the grapes and the excel spreadsheet. They were used in the instruction of algebra and graphs. Teachers who used the protectors had prepared their own content. In one occasion, they used cartoons for instruction.

Table 2 is used to answer hypothesis two and three, the table shows the relationships between different characteristics of the respondents and the use of computer aided instruction. It includes the variables of school type and the K.C.S.E. school mean. The table has Columns showing the pared variables, N, the correlation coefficient and the level of significant.

Table 2: Relationship between Different Respondent Characteristics and Computer Aided Instruction

Paired Samples Correlations

Pairs of Variables	N	Correlation	Sig.
Computer aided & K.C.S.E. school mean	20	.62	.004
Computer aided & Type of school	20	.54	.014
Computer aided & years of experience	20	.23	.315
Computer aided & age brackets	20	.14	.548
Computer aided & highest qualification	20	.46	.039
Computer aided & type of gender	20	.20	.395

From table 2, it is noted that the relationship between different the K.C.S.E. School mean and computer aided instruction is +0.62 which is the highest positive correlation. The relationship between computer aided instruction and type of school is at -0.54. This indicates that there is a strong negative relationship between computers aided mathematics instruction and types of schools. The relation between the use of computer aided instruction method and different teacher respondent's characteristics such as teacher's years of experience, age brackets, highest qualification and gender is 0.24, 0.14, 0.46 and 0.20 respectively which are weak insignificant positive relationships. Table that follows below shows the relationship between different characteristics of the respondents and the K.C.S.E. mathematics schools mean scores. The high positive correlation of 0.62 indicates that the incorporation of computer aided instruction onto mathematics instruction do influence greatly positively the students' scores in mathematics. The correlation indicate that the students who are thought using the computer aided instruction score high graded while those who are thought using the traditional methods score low grades in mathematics.

The other respondent's characteristics which have strong positive correlation above average include the type of school with a correlation of 0.84 and the teacher qualification of 0.46 which are within the average of 0.50. This average level of correlations indicates that the use of computer aided instruction on students instruction is influenced by the type of schools which are the National Schools, County Schools and the Extra County Schools. The category of schools determines the facilities which are found in the schools. In that the National School does have better facilities then the other County and Extra County Schools. The Kenya Government do categories schools in the above manner aided by the facilities available in schools and the students entry behavior that if the students mean scores in K.C.P.E. The students who score a high mean of above 380 marks out of 500 marks are admitted to the National Schools while those of above 300 marks are admitted to the County Schools. The student's entry behavior could be considered as one of the predictors of student's academic achievement in K.C.S.E. The other point which should be noted is that the students admitted to the National Schools are a mixture of students from other Counties, in which there could be an indication that these students are more exposed to computer technology than the others.

Teacher qualification is the levels of teacher's education and training which are the Diploma in Education and the degree indicated by B.Ed. which means Bachelor in Education. The correlation between the use of computer aided instruction and the teacher level of education is at 0.46 which is within the average of 0.5. The correlation indicates that there is a positive average correlation between teacher qualification and the use of computer aided mathematics instruction, which implies that the higher the teacher qualification the more/better use of the computer technology. Teachers are encouraged to have more training and advance in the Education, So that they can be able to use the computer aided instruction. School boards are also encouraged to employ teachers with B.Ed. who are better trained in computer technology. The correlation between the use of computer aided instruction and years of experience, age

brackets and teacher gender are low. This indicate that the use of computer aided mathematics instruction is influenced less by the teacher characteristics of teacher experience, teacher age and gender. It also signifies that the three respondent's characteristics should not be considered during teacher employment and there should be no discrimination. The predictors which determine the efficient use of computer aided mathematics instruction which in turn influence the school performance are the type of schools and the teacher highest qualification. The other three predictors of teacher years of experience, age brackets and teacher gender do have a low influence. The relationship between the use of computer aided mathematics instruction and different respondent's characteristics such as gender, teacher experience, age brackets and highest qualification was generated from the table. The regression equation was formulated from the r values, the dependent variable being the use of computer aided mathematics instruction represented by Y. The independent variables were the respondents characteristics such as gender, teacher experience, age brackets and highest qualification were represented by x_1, x_2, x_3, and x_4 respectively. The equation $Y=0.2x_1+0.23x_2+0.14x_3+0.46x_4 + C$ was generated, where C represents the school type and other variables that are not included in the study.

5.2 Conclusion

In general computer aided instruction is beneficial to students because it makes the learning of mathematics interesting, it gives more practice, it enhances students understanding, it is used for illustration and demonstration, it is used in mathematics problem solving and improves the learners concentration in class.

The challenges facing the use of computer aided mathematics instruction include; the organization problems such as lack of infrastructure and power breakdown, untrained teachers and lack the computer operation knowledge and the required skills to cope up with the dynamic changes that come with computer aided instruction. Students have visual problem. Sometime controlling students is a problem and lastly lack of enough time in the preparation of lessons. Presnky (2008) concurs that the choice of integrating computer-aided mathematics instruction is determined by the availability of computers in schools and the teacher's knowledge of using them. He also articulated that students learned more when power point was incorporated into the instruction lesson. The researcher found that unrelated slides presentation ends in lower in comprehension. The problems can be curbed by ensuring that all schools have adequate supply of computer and electricity. The teachers have proper training on how to use computer in mathematics instruction and also have adequate supply of the computer software's. Federico and Massimo, (2013) gave the statement useful about some of the opinions of ICT development in secondary schools subject teaching. They expressed that the characteristics of excellent general secondary provision include: (1) handiness of various groupings of resources to match the requirement of departments, for instance computer rooms, cluster of machines and individual workstation round the site. (2) Computer network and well maintained with web access from all work stations. (3) Well-lit comfortable computer rooms with sufficient space for pupils to work away

from computers and for teachers to manoeuvre spherical and speak with pupils. (4) Effective communication with the complete room using digital projectors or capability to control all the computers. (5) An efficient and equitable booking system for pc rooms.

A number of responses indicate the need for more specialized training. The required training seen to be more relevant to identify applications for computer aided instruction for integrating the content. For example, a respondent remarked. Another sediment given by another teacher was as follows; "I finished university pre- computer age and don't seem to have been given the time or training to gain adapter skills in the use of technology". Other factor that inhibits the use of computer technology in mathematics instructions is unreliable school technology system.

The following content was given by one of the teachers; "I feel that one of the factors that retard the positive use of computer technology in mathematics instructions in the classroom is the unreliability and un–user friendly of the network and unavailability highly resourced computer lab". Others were not embarrassed to make mistakes as they integrated computer aided instruction. Some of their sediments were; ("Everything I do in classroom I do with technology I have worked through trial and error") or simply by leaving from pupils and adopting a humble pasture of leaving (" I hope to continue to learn new technologies as they emerge as well as learning from my students who are always up with the times ").

More importantly, a number of teachers reached the stage where acquiring ICT skills in teaching had become a developmental and on-going process. Some of the comments they gave are "presently trying to catch up to others by doing courses, it all takes time!" This implies that they don't have time to attend the computer courses. Another comment is that "I am current trying to upgrade my skills in the areas of ICT …….. Our school use packages and the computer teacher to teach ICT and I don't have time".

Interesting, to supplement skilled competency, some lecturers resorted to totally different individual initiatives, like buying their own ICT equipment to advances their skills. "I am presently making an attempt to upgrade my skills within the space of ICT. I actually have purchased a laptop and can engage colleagues as well as the computer teacher in the school to show me how to use it for classroom teaching".

5.2 Recommendations for Practice

The following recommendations were made from the foregoing discussions in the light of the findings:

Computer aided mathematics instruction can be effective if the most appropriate hardware, software support is available to teachers and pupils. Teachers and pupils should be equipped with ICT skills which are adequate to achieve the objectives set for them.

There should be an appropriate meditation by teachers between pupils and computers, so that where pupils are expected to become active learners, the teacher provides support other than direction. Pupils should be encouraged to take advantage of the automation of tasks and instant feedback by ICT, making use of conjecture and

applying trial and error methods in their work. Teachers should be aware of the range of software available and select programs to support particular learning skills. The on and off – computer time and power should be balanced in accordance with learning needs. The pupils with special needs should have equal access to ICT through access devices. Computer classes should be made compulsory to all pupils and teachers and be used for instruction in all subjects.

The research findings are supported by several researchers along with (Chingos, 2012) who expounded that students analyze through participation and interplay with people, teachers, friends and educational substances such as textbooks, workbooks, academic software internet-primarily based content material, homework projects, quizzes and check. He compared the interaction and material choice to the treatment given to patients by the doctor in a hospital.

The challenges facing the use of the integrated computer aided mathematics instruction should be addressed both at school and teacher level. The challenges include; the complaint by teachers on time and work load where they complain that lesson planning and presenting an ICT integrated lesson is time consuming. They also cited the problem of computer literacy among the students and teachers in schools. Inadequate facilities and resources in schools especially the computers, ICT mathematics software awareness, availability and how to use them was another challenge. Teachers had a negative attitude and were not ready to embrace change in the teaching methods and procedures.

Based on literatures review, the rationale of Kenya Government policies and the research findings, recommendations are made to the following groups.

5.3 The Kenya Government

For the reason that authorities has supplied at no cost text books to all students in secondary schools, need to increase also by using offering ICT mathematics tools, facilitate teacher schooling, inspire the teachers to attend ICT training via giving allowances and incentives and with the aid of selling the teachers who do combine computer aided practise into their teaching and gaining knowledge of system. If possible, one teacher can be trained per school to be an ambassador to other teachers. So that it will demystify ICT integration in schools, the government via the ministry of education has to make it a policy that ICT integration be implemented and prolonged into all subjects.

Government should support, facilitate and encourage the use of ict pedagogical devices which includes CAI in secondary faculties arithmetic training by using imparting adequate ICT gear in schools for teaching and gaining knowledge of process together with arithmetic instructional software's, computer, the internet services and electricity connections. ICT orientation programs ought to be organized for teachers so as to expose them to effective adoption CAI into course content and in classroom instruction designing. Government ought to place in place measures to combat the epileptic power offer in African nation thus on encourage effective ICT adoption in schools.

The Ministry of Education in collaboration with the KICD has to pay necessary attention to teachers' training in mathematics. There ought to be a lot of compulsory mathematics, technology use courses as a part of initial teacher training. The government Education agencies such as the KNEC, the KICD and the Ministry of Education should collect data from different counties and Sub counties on the instructional materials in use in the schools. The collection of comprehensive and accurate data will require the government to survey counties in cases counties may need to survey their schools. The government agencies especially the Ministry of Education can quickly glean useful information on the use especially the incorporation of computer technology in Education instruction.

References

Amin, E. M. (2005). Social Science Research; conception Methodology and Analysis. Kampala: *Makerere University printers.* And what is known about its instructional effectiveness. In Gibson et al. (Eds.), *Proceedings from society for information technology & Teacher Education International Conference 2009* (pp.1748-1753). Chesapeake, VA: Association for the Advancement of computing in Education (AACE).

Chingos, M., Grover, J. & Russ, W. 2012. Choosing Blindly Instructional Materials, Teachers Effectiveness, and the Common Core *Education Policy Journal at Book Kings* April, 2012.

Clark, J. (2008). PowerPoint and pedagogy: Maintaining students' interest in university lecture. *College Teaching*, 56(1), 39-44. Retrieved from Ebscohost database

Creswell, J. (2012*).* Educational research: Planning Conducting and Evaluating quantitative and qualitative research (4th Ed.) Boston, MA: Pearson Education, Inc.

Freik, W. & Howard, L. (2000*) Foundations of Behavioural Research*. Harcourt College Publishers

Koibatek Sub county Education Office. (March, 2017). *Baringo County Strategy for Education*. Lonka Printers Ravine.

Langton, M., Manwaring, K., Fry, L., & West, R. E. (2015). Educational technology research journals: *Journal of computing in higher education,* 2003-2012 Educational T echnology, 55(1), 44-48.learning: A meta-analysis and review of online learning studies. Retrieved from www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Peck, R. Olsen, C. and Devore, J (2010). *Introduction to Statistics and Data Analysis*. Australia: Brooks/Cole C. engage learning.

Presnky, M. (2008). The Role of Technology in Teaching and Classroom. *Educational Technology* retrieved from http://www.marcprenskycom/writing.

Spenger, M. (2010) Brain*-based teaching in the digital age*. Alexandra: ASCD.

Tapscott, D. (2009). Grow up digital: How the next generation is changing your world. New York. McGraw. *Hill Ts and Logistics Group (2011). E-learning*.

.

Creative Commons licensing terms
Author(s) will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Education Studies shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflicts of interest, copyright violations and inappropriate or inaccurate use of any kind content related or integrated into the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a Creative Commons Attribution 4.0 International License (CC BY 4.0).