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ASSESSMENT OF THE INFLUENCE OF COMPUTER AIDED MATHEMATICS INSTRUCTION ON STUDENTS PERFORMANCE OF PUBLIC SECONDARY SCHOOLS KOIBATEK SUB COUNTY, KENYA

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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 increasingly complex functions. The problem is that inadequate of availability to and use of computer technology in mathematics instruction is placing students at a disadvantage and not meeting the educational needs of today's students in Kenyan high schools in general and Koibatek Sub County in particular. The problem is exaggerated by the mathematics instructional abilities that have not yet currently appeared within the students yet during the learning process. This research examined how the use of computer aided mathematics instruction influences the students' academic achievements in high schools in Kenya, focusing on Koibatek Sub County. The mixed embedded concurrent design was used. The quantitative the ex-post-facto design method was the main method while the qualitative method becomes the secondary method. The probability and non-probability techniques of sampling were 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 the national exam mathematics results of 2016, questionnaires and interview guide. The data collected was used to identify the benefits and the influence it has on the student's academic performance. 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 showed that the computer aided mathematics instructional method do influence students achievement in mathematics, there was a significant difference in the mean score of students taught using the

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incorporated computer technology instructional method and those taught using the talk/chalk method. The research 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 needs to introduce professional development programs in education system for practicing teachers to enable them acquire relevant skills and knowledge to be used in the incorporation of computer technology into mathematics instruction.

Keywords: assessment, computer aided mathematics instruction, students' performance, public secondary schools, Koibatek Sub County, Kenya

1. Introduction

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 average score in mathematics for the last five years in Koibatek Sub County has been below 30% (Koibatek Sub County Education Office, 2017). In Koibatek it has been very poor with most schools having a mean of D in Mathematics. There are inadequate instructional resource in the teaching of mathematics and inability of teachers to use them in Koibatek. 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, Norton and Hartaway (2008) in their study at Ohio University said that teachers are to blame for the dismal achievement in mathematics especially on the inappropriate methodology. Others have blamed peer pressure (Bassay, 2002). No study has been done to ascertain the influence of integrating computer-aided mathematics instructional resources in the teaching and learning of mathematics on student's performance at the high school level in Koibatek Sub County.

Presnky (2008), Tapscott (2009) and Spenger (2010) stated that computer aided instruction has influenced the way present students learn. The availability and access to technology vary greatly among school learning environment. The problem is the inadequacy of access to and use of computer aided instruction materials is placing learners at a disadvantage and not meeting the educational needs of today's students. This has prompted the researcher to carry out this study in Kenya Secondary Schools. Specifically, the study addresses the question, what is the influence of incorporating computer-aided mathematics instruction in secondary schools on student's academic performance in Koibatek Sub County, Kenya? The problem of the study is; how is mathematics taught? Which methodology is used? Are the methods applied in teaching mathematics the cause for poor performance or teacher qualification? Is there any influence of the computer-aided mathematics instruction on student's academic performance? The arithmetic communication ability has not presently appeared among

the students nevertheless throughout the teaching and learning activities. 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 rising the arithmetic communication ability. This study find out the contribution of computer aided instruction in teaching mathematics and its influence on student's mathematics performance in K.C.S.E. in Koibatek Sub County.

In Eysink, Berthold and Kolloffel (2009) studies on mathematics instruction, the study did not look at the need of teacher guidance in the choosing of the resources and materials. Also, it did not look at the specific types of resources, computer technology use and how their manipulation is done which is handy in making recommendations for mathematics instruction. This research looked at specific instructional resources and how the manipulation can be done to enhance the teaching and learning of mathematics. Mathematics instruction needs to be enriched with mathematics content knowledge, pedagogical knowledge, and technological knowledge. Study needs to be performed to discover effective instructional methods supported by empirical evidence. Learners want to be engaged in their learning, and they expect learning to be fun and creative regardless of your acceptance. There is a need for more empirical evidence concerning computer technology on how the teachers can enrich their mathematics content and articulate the content for enriching discourse within the subject area. The framework for the twenty-first-century learning incorporate educators to specialise in using technology that develops learners who can think critically and be ready to apply their knowledge creatively. After reviewing the works above, it has been revealed that the factors that lead to the weak academic achievement in secondary school certificate examination include lack of interest, lack of qualified teachers and teaching materials. There is no study which has looked at the teacher's role, knowledge and commitment in the use of computer aided mathematics instruction. Convergent mixed research design was applied in this study to consider four variables namely teacher role, teachers knowledge and teacher commitment in the integration of a computer technology, availability of adequate instructional resources and materials in schools. The study had a purpose of finding out which of the instructional material variables had a relatively higher coefficient than others. Although the teacher variable had a considerable effect on learners academic achievement, this research will looked at a combined variable and mainly the available and use of mathematics instructional materials, resources and, incorporating computer technology mathematics instruction. It will also look at whether there is a significant difference in the mean achievement of the learners using the appropriate resources, materials and incorporating computer technology instruction and those who are taught using the traditional method.

The study was directed by the following objectives;

1. To establish the benefits of integrating computer-aided mathematics instructional resources into the teaching and learning of mathematics in secondary schools in Koibatek Sub County

2. To determine whether there any Influence of computer-aided mathematics instruction on student's academic performance
3. To establish whether there is a relationship between the mean achievement scores of the K.C.S.E. exams and the use of computer aided mathematics instruction method.

2. Methodology

This is a mixed research design study which is specifically embedded concurrent design (Creswell, 2012).In this mixed method; the quantitative method become the main method while the qualitative method will become the secondary method. The quantitative part used the ex-post-facto design while the qualitative part used the case study design which is a causal study type. Particularly it will employ multivariate cases to examine plurality of influences (Yin and Moore, 1988). 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 use of appropriate instructional resources that have effects on students' achievement. The pieces of information that was collected include the teachers' views on using the instructional media, materials and the use of computer-aided mathematics instruction. 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.

A summary of the target groups, population, sample size, and sampling procedure is shown in Table 3 below. The table has Columns showing in the first Colum the target groups which are the schools, the head of mathematics department, the mathematics teachers and the form three pupils. The other Columns show the population (N), the sample size (n) and the sampling procedure

Table 1: Population, sample size and sampling procedure table

Target Groups	Population(N)	Sample Size (n)	Sampling Procedure
Schools	21	7	Stratified / Simple random
Heads of maths department	21	7	Purposive sampling
Teachers of mathematics	40	21	Purposive sampling
Form three pupils	565	140	Purposive sampling

A multilevel mixed method sampling strategy was used. It involved four levels of Koibatek Sub County educational settings which were; schools, streams in the schools, teachers and students The data collection tool includes questionnaires, interview guide and the 2016 K.C.S.E. mathematics results.

3. Analysis of Results and Discussion

3.1 The Benefits of Computer Technology in Mathematics Instruction

The teachers and students questionnaires were designed with the statement "I am able to use technology to" in order to identify the benefits of computer technology in preparing mathematics content and instructional knowledge. Spaces were left for the respondents to state the benefits of computer aided mathematics instruction. The researcher used scores to compare responses to individual questionnaire items in the parts of pedagogical and content knowledge tables. All responses were coded in a 4-point likert scale arrangement from very able, able, less able and not able. In general, scores but 3.0 were examined on a time move through unable and less able to slightly below average. Whereas scores bigger than 3.0 depicted a time starting from slightly above average to very high. A score of 3.0 would indicate an orientation that lies midway at a specific ability level.

Table 2 shows the teachers questionnaire scores range. The score range was used in the descriptive statistics in analysing the responses given by the respondents which include the mean scores and standard deviation.

Table 2: Teachers Questionnaires Score Range

Score Range	Qualitative Description
1≤ x<2	Not able
2≤ x<3	Less able
3≤ x<4	Able
4≤ x<5	Very able

Table 3 shows the average scores and standard deviation for the Technological pedagogical knowledge of the teacher's responses. The table has Columns showing teacher's responses on the ability of the respondents to use of computer aided instruction, minimum, maximum, the mean and the standard deviation. In summary, the responses point to the way computer aided instruction is applied by the teachers in schools.

Table 3: Mean Scores and Standard Deviation of
the Technological Pedagogical Knowledge of Teachers Responses

Technological pedagogical knowledge

Teachers responses on the use technology to	Min	Max	Mean	Std. Deviation
Assist students to develop their math's problem-solving skills	2	4	3.5	0.67
Present mathematics problems linking symbolic numerical and graphical data.	2	4	.35	0.67
Demonstrate mathematical models or ideas through learning objects (e.g. animation, simulations, on-line applications)	2	4	3.25	0.55
Identify trends and patterns to predict potentialities.	2	4	3.25	0.64
Explore or present mathematical content in kind of other ways.	1	4	3.2	0.83

Collect, analyze and interpret information to create knowledgeable judgment.	2	4	3.5	0.61
Incorporate authentic tasks within the learning of mathematics.	2	4	3.30	0.57
Promote substantive student communication in a mathematics lesson. (E.g. class discussion on multiple methods of solving problem).	3	4	3.75	0.44
Integrate the study of math's with content from other key learning areas (English, Arts, Science, History)	1	4	3.45	0.83
Support students' mathematics investigation with digital tools (e.g. audio video recording, measuring devices etc.)	1	4	3.1	0.88
Valid N 20				

From table 3, the technological pedagogical knowledge responses had scores that were above average. The table scores present capacities that teachers enacted across the curriculum. The highest and most consistent response was to the general statement regarding teachers abilities to use computer technology to promote substantive student communication in mathematics lesson (e.g. class discussion on multiple methods of solving problems) 8 which had a mean of 3.75 and a low standard deviation of 0.44. Similar results were found for collecting, analysing and interpretation of data to make informed judgment and assisting students in developing their math's problem solving skills, each had a mean of 3.5 and a standard deviation of 0.67 respectively. The mid-range scores of responses to the items 3, 4, and 5. And 9 which are demonstrating mathematics models or concepts through learning objects, identifying trends and patterns to predict possibilities, incorporate authentic tasks in learning mathematics and integrate the study of mathematics with other subjects indicate that teachers had low ability to demonstrate the skills or the limited use of this technology. On the other hand, the above items had a high standard deviation. Which implies that a small number of schools or teachers use this skill. The low mean for item 5 ("Explore or present mathematical content in variety of different ways"), which had scored a mean of 3.2 and item 10 ("support students mathematics investigation with digital tools") with a mean score of 3.1, related to the narrow confines and traditional pedagogical typical observed in secondary mathematics lessons.

The table B in the questionnaire on the technological content knowledge was used to determine the benefits and whether teachers had the ability or use computer technology in mathematics instruction. Comments by the teachers pointed that computer aided instruction in the following ways 1. It improves interaction between teacher and students. 2. It enhances understanding of complex concepts and improves concentration among others. There was need to have a guided outline on what computer technology does in terms of content knowledge preparation.

Some teachers, especially a few highly experienced teachers, had well-thought-out methodological reasons for their decision to work with power point or to avoid to it. Mr. Kaput, (not his real name) the Mathematics teacher whose students put together power point presentation to show their learning had spent significant amount of effort

on developing power point lesson on various topics. He uses them often, as do some of his colleagues in the mathematics department .When I asked him about using power point based lessons, he explained that the tool provides a level of assurance that all the important points will be covered and the learning objective will be met. In his words: "if my lesson is such that I know where it's going; for instance, simultaneous equation. I know exactly the structure of how I want to deliver that over a series of three to four lessons to get a particular, complete objective achieved. I know that it is neater, it's tidier, and I am not going to go wrong. As I see something, I correct it so that next time I won't make mistake again, I don't have to rely on memory……..."

Another teacher had a complete different approach to use of computer technology in Mathematics instruction and especially the use of power point in his lesson. During my observation in his classroom, I noticed that ICT use featured predominantly. He also made significant use of the chalkboard in front of classroom. Interestingly, there were no prepared materials involved in his computer technology enhanced lesson presentation, when I asked him about preparing his lesson notes ahead of time he dismissed the idea on methodological grounds. He explained that presenting information like this denies students the chance to experience, and value the process.

Table 4 shows the technology content knowledge descriptive statistics of the teacher's responses. It has Columns showing teachers responses on the use of computer technology in various areas, minimum, maximum, mean and standard deviation. The table indicates the actual us of computer technology in the sampled schools.

Table 4: Technological Content Knowledge Descriptive statistics of Teachers Responses

Technological content knowledge

Teachers responses on the use technology to	**Min**	**Max**	**Mean**	**Std. Deviation**
Create PowerPoint presentation.	2	4	3.35	0.81
Create and edit easy pictures e.g. Microsoft point or Photoshop.	1	4	2.95	0.89
Make calculations on a spreadsheet.	1	4	2.85	0.99
Create charts/graphs employing a spreadsheet.	2	4	3.35	0.74
Use a graphic calculator.	1	4	2.75	1.02
Locate and evaluate math's online applications and tools of learning objects.	1	4	3.00	1.03
Use dynamic geometry software (geogebra, geometers, sketchpad, autograph, cabri)	1	4	2.55	0.89
Use computer algebra software (e.g. derive mathematics instruction)	1	4	2.8	1.11
Construct multimedia objects embedding pictures, sounds and animals)	1	4	2.8	1.01
Network with other colleagues and skilled associations through on-line forums, Facebook twitter etc.	1	4	3.05	0.94
Valid N 20				

The relatively high mean scores for the items related to creation of power point presentation 1, create charts/graphs using a spreadsheet 4 and network with other colleagues and professional associations through online forums, face book etc. These items had a mean of 3.35, 3.35 and 3.05 with a relatively low standard deviation of 0.81, 0.74 and 0.94 respectively.

Mathematics teachers are likely to use spread sheets for recording students test marks, and power point is used widely in schools for making presentations in meetings. The other mean scores that are above average for item (10) network with other colleagues and professionals associations through online forums, face book etc. probably reflects the fact that teachers are becoming increasingly knowledgeable in using the internet and consulting with other colleagues.

The use of computer algebra software (8) and the use of dynamic geometric software GeoGebra (7) had a low mean score of 2.8 and 2.55 with a standard deviation of 1.10 and 0.89 respectively. These results indicate that teachers are aware and use the software in mathematics instruction. The results for the dynamic GeoGebra software (7) are more likely to indicate a gradual growth in the use of this technology in mathematics instruction. These two kinds of computer technology software for mathematics instruction (GeoGebra and Grapes) are commonly found in the market.

The teaching and learning activities skills can be aroused and be enhanced by different instructional resources. The skills include; illustration, demonstration, clarity, relating, accuracy in problem solving and enhancing understanding. Indeed there is a large variety of uses of computer technology in Mathematic instruction ranging from simple to more innovative, dynamic, interactive and flexible tools .They aid pupils in tasks as indicated above such as computation ,illustration, visualizing explaining and evaluating the pupils understanding. The most recent educational technology is more flexible and more interactive in the sense that it is adoptive to the needs of each individual as remarked by (Beal et al, 2010). Examples of such instruments used by teachers in Koibatek Sub County as observed by researcher including Geogebra, Scientific calculators, Spread sheets, the grapes and the networking services. Teachers having to be innovative with what they have in the class. Shulman (2010) reemphasized that the effectiveness of the methodology used in teaching mathematics is that the main contributor to achieve learning. He also posited that teacher's methodology could be a powerful predictor of learner's motivation and educational performance. There is need that teachers to organize and sequence their presentations in classroom for it determines the outcomes. Outcome in this context refer to learner's academic performance in mathematics.

In general, computer technology can effectively realize the methodological dream of having the school curriculum more interconnected, that is, by integrating "the study of mathematics with content from other key areas "by allowing students and teachers access a wealth of information, both on-line and interactive, that goes beyond historically dominant written material at school setting. Audio/video recordings, measuring devices and different media will support student's mathematics investigations with digital tools as a result of student's role has changed from

consumers to producers of knowledge. When the Mathematics instructional method is dominated by student centered method of instruction.

Table 5 shows the mean and the standard deviation of the respondents' responses. The table has Columns showing the resource that arouses learning, minimum; maximum the mean and standard deviation. The maximum score for a resource was 6.

Table 5: Mean Scores and Standard Deviation of the Teachers Responses on the Skills Aroused by different Instructional Resources

Descriptive Statistics

Resources that Arouse learning	Min	Max	Mean	Std. Deviation
Class text book	1.00	6.00	2.55	1.76
Reference books	1.00	6.00	3.05	1.73
Charts	1.00	6.00	2.75	1.06
Three Dimension models	1.00	6.00	3.15	1.04
Radio lessons	.00	6.00	2.45	1.47
Use of projected media, film and slides	.00	6.00	3.45	1.76
Use of projected writing	1.00	6.00	3.15	1.56
Use of drawing apparatus	1.00	6.00	2.75	1.55
Use of computers	1.00	6.00	4.20	1.77
Use of calculators and logs	1.00	5.00	2.45	1.39
Valid N (list wise) 20				

The results in the table 5 indicate that the instructional resources that are related to computer aided instruction such as use of computers, use of projected writing, and projected media and slides which had a mean of above 3.1 which is above average. The use of computer had a mean of 4.2 and a standard deviation of 1.76. This implies that the computer instruction resource arouses on average more than 4 skills out of 6 skills.

The open ended part of the questionnaire was filled by both students' ad teachers. A number of students expressed their views and comments that when computer technology is used in mathematics instruction it: is used in relating mathematics problems to the real life situation, retention of knowledge and learners concentration, increasing the speed and accuracy in problem solving, improving clarity and understanding mathematics concepts, Increasing activeness in class and in giving students more practice.

Table 6 shows the frequencies of the student's responses on the benefits of the use of computer aided instruction. The table has three columns showing the students responses, the frequencies and the percentages. The rows on the student's responses show the responses that had high frequencies such as relating mathematics problems to real life situation, retention of knowledge and learners concentration, speed and accuracy in problem solving, clarity and understanding mathematics concepts, increase of activeness in class and giving students more practice.

Table 6: Frequencies of the Students Responses on the Benefits of using Computer Aided instruction

Students Responses	Frequencies	Percentage
Relating mathematics problems to the real life situation	25	17.86%
Retention of knowledge & learners concentration	35	25%
Speed and Accuracy in problem solving	80	57.14%
Clarity and understanding mathematics concepts	45	32.14%
Increasing activeness in class	28	20%
Giving students more practice	21	15%
Totals n=140	**140**	

There were a relatively high percentage of the student's responses 57.14% in the item of problem solving. This indicated that the students were looking at the benefits and influence of computer aided mathematics instruction on the problem solving skills. The other benefit that had a relatively higher mean is the item on clarity and understanding mathematics concepts 32.14%. Other responses include relating mathematics problems to the real life situation 17.86%, retention of knowledge and learning concentration 25%, increasing activeness in class 20% and giving students more practice 15%. The teachers also gave their responses which were related to the student's responses on the benefits of the computer aided mathematics instruction.

Table 7 shows the teachers responses on the benefits of the computer aided mathematics instruction during lesson preparation and presentation. The table has columns showing teachers responses, frequencies of the totals, percentage of the totals frequencies of the use and the percentage of the use.

Table 7: Frequencies and Percentages of the Teachers Responses on the Benefits of the Computer Aided Mathematics Instruction

Teachers Responses	Frequencies of the totals	Percentage of the totals	Frequencies of use	Percentage of use
Improvement of interaction	6	30%	6	54.54%
Enhancing of understanding of complex concepts	10	50%	10	90.9%
Improving the students concentration in class	8	40%	8	72.72%
Clarity and understanding abstract mathematics concepts	7	35%	7	63.63%
Increasing activeness in class by making lesson interesting	8	40%	8	72.72%
Motivation the learners	6	30%	6	54.54%
Totals	**20**		**11**	

The results in the table indicated that a high percentage of the teachers who had integrated computer technology instruction 90.9% agreed that the computer aided instruction enhances students understanding of complex concepts. They also conceded

that it increases activeness in class by making lesson interesting and improves the student's concentration in class each 72.72%. Teachers commented that the illustration skills, demonstration skills, clarity skills, accuracy in problem solving skills and enhancing understanding skills are aroused/enhanced when computer aided mathematics instruction is used. One of the teacher respondents commended the use of computer aided instruction and especially that; "I didn't know how to use geogebra a lot in terms of teaching and I ended up one of the biggest user in the past month when I was teaching quadratics, quadratic equations and solving functions. I just built the basic quadratic formula with a, b and c as parameters (i.e. $ax^2 + bx + c = 0$). We went through ten minutes of each class. We began – okay a one and what kind of change do you see in b and c? What happens? Do it and show what happens. May be I could take a and b animated and see how c changes. It is nice to show things going up and down. I think that was one of the biggest things, probably the biggest depth of learning for my algebra students for the entire year being able to see that every day. We started factoring a quadratic equation and graphed them. We were able to see two different lines in the graph as the factors". The comments from the teachers indicate that they are interested with the use of computer aided instruction and they are putting effort to learn its use. The researcher observed that teachers and students actively participated in class during the use of computer technology mathematics instruction. For instance, students were keen in class, learning was enjoyable, students were attentive and a positive attitude towards the subject. It was observed that computer aided mathematics instruction made the teachers to design project as per need, to go for problem based learning and find out the solutions to meet teacher competency. The comparison of major benefits obtained from incorporating Computer aided mathematics instructional method with conventional teaching method is summarized as shown below. The summary below shows a comparison of class room teaching and computer aided instructional teaching model.

Table 8: Comparisons of class room teaching and computer aided instructional model

Computer aided instructional method	**Classroom teaching**
Conventional method	Contemporary tool
Teacher-faculty centered	Learner-student centered
Unidirectional as controlled by teacher only	Interactive as teachers, students, professional colleagues are involved
Teaching and learning becomes routine prototype process	Teaching learning process becomes interesting with novel ideas from different professionals
Focus on memorization of topic	Focus on understanding and clarity of concept
More emphasis on writing skills, neglecting oral communication and presentation skills	Development of writing skills along with attaining excellent oral communication and presentation skills
Teachers get poor or no feedback from students	Teachers get actual and continuous feedback from students
Students are passive recipients	Students are active participants

The summary above indicates that the computer aided mathematics instructional method is student cantered. Teachers get continuous feedback from students, students actively participate in class, it focuses on understanding and clarity of concepts and teachers can interact with other teachers which make the teaching process to become interesting by the fact that teachers get noble ideas from different professionals. Indeed when computer aided instruction is incorporated into mathematics instruction learning become more interesting.

3.2 The Influence of Computer Aided Mathematics Instruction on Student's Academic Performance

This part is aimed at answering question 5 which looks at whether there is any influence of computer aided instruction on student's academic performance. In order to answer this question, it was necessary to collect information on student's performance at different category of schools.

Table 9 shows the distribution of the K.C.S.E mathematics means scores 2016 according to the school performance. The table has Columns showing the school mean score, frequencies, percentage valid percent and cumulative percent.

Table 9: Distribution of K.C.S.E Mathematics Means scores 2016 of Different Schools KCSE school mean

Schools Mean	Frequency	Percent	Valid Percent	Cumulative Percent
1.94	3	15.0	15.0	15.0
2.02	3	15.0	15.0	30.0
2.45	2	10.0	10.0	40.0
2.82	3	15.0	15.0	55.0
2.91	3	15.0	15.0	70.0
4.88	3	15.0	15.0	85.0
7.49	3	15.0	15.0	100.0
Total	**20**	**100.0**	**100.0**	

From table 9 the school means scores for K.C.S.E. mathematics ranges from 1.94 to 7.49 out of 12 points. The percentages are equally distributed at 15% apart from the 10% which is the mean of 2.45 which was obtained by the schools which had two respondents.

Table 10 shows the mean and the standard deviation of the two groups of schools/teachers who use computer aided instruction and those who don't use the computer aided instruction. The table has columns showing the use and none use of computer aided instruction, the N, mean, standard deviation and the standard error mean.

Table 10: Table showing the Mean Scores and Standard Deviation of Schools Group Statistics

	Computer aided	N	Mean	Std. Deviation	Std. Error Mean
KCSE school mean	None use	9	2.26	.42	.140
	Use	11	4.61	2.07	.63

The results in table 10 shows that there is a difference In the 2016 K.C.S.E. mathematics mean scores of the students whose teachers use the computer aided mathematics instruction with a mean of 4.6 and a standard deviation of 2.07. The group of students whose teachers do not use the computer aided mathematics instruction had a mean of 2.26 and a standard deviation of 0.42. The large standard deviation in the first group, imply that there is a variation in the range of the mean score some getting high scores and others low scores.

Teachers and heads of mathematics department from the schools which use computer technology consented that the method of instruction influence students learning and performance in several ways which include; making learning enjoyable, improving the learners understanding, changing the learner's attitude towards mathematics and leading to better academic performance.

Table 11 shows the teachers responses on the influence of computer aided mathematics instruction on students leaning. The table has Columns showing teachers responses, frequencies and percentages. The teachers commended that, the use computer aided instruction makes learning enjoyable, enhances learners understanding, changes the learners attitude improves learner's discovery, improves learner's concentration and improves learner's performance.

Table 11: Frequencies and Percentages of Teachers Responses on the Influence of Computer Aided Instruction

Teachers responses	Frequencies	Percentages
Making learning enjoyable	11	64.7%
Enhancing learners understanding	15	88.23%
Changing learners attitude	12	70.58%
Improving learners discovery	13	76.47%
Improving learners concentration	10	58.82%
Improving students' academic performance	15	88.23%
Totals	**N=17**	

The results in table 11 indicate that majority of teacher's consent that the use of computer aided instruction leads to improving learners understanding which lead to improving student's academic performance 88.23%. Other responses had above average percentages which include; making learning enjoyable, changing learner's attitude, improving learner's discovery and improving learner's concentration.

Table 12 shows the correlation between the K.C.S.E. mathematics means scores 2016 and the use of computer aided instruction. The table has columns showing the variables being compared, that is the K.C.S.E. mathematics school mean 2016 and the

use of computer aided mathematics instruction and the Pearson's correlation coefficient.

Table 12: Correlation between the K.C.S.E. Mathematics Means Score and Use of Computer Aided Instruction

Correlations			
		KCSE School mean	**Computer Aided**
K.C.S.E. School mean	Pearson Correlation	1	.617**
	Sig. (2-tailed)		.004
	N	20	20
Pearson Correlation	.617**	1	
Sig. (2-tailed)	.004		
		20	**20**

The results of the Pearson correlation as shown in the table above indicate that there is a strong positive correlation of 0.617 between the K.C.S.E. mathematics results and the use of computer aided method of instruction. This implies that the computer aided method of instruction influences the student's performance in K.C.S.E. mathematics. The result does not show how each of the variables the students means scores and the use of computer aided instruction do affect each other. The casual effect analysis will be done in the next table where the researcher investigates the relationship between the use of computer aided mathematics instructions method with different respondents characteristics and the relationship between the K.C.S.E school mean scores with different respondents characteristics.

4. Conclusion

Based on the result of the research and discussion, it can be concluded that teaching materials based on computer aided instruction that is developed it has been worthy used on instruction in secondary school mathematics, because it scored a correlation result of 0.617 which is a strong positive correlation between the students' performance and the use of computer aide instruction. This result is a valid, Except that, teaching material based on computer aided instruction that is developed by means of teachers will increase students gaining knowledge of consequences. It can be seen that the frequencies and percentage of teacher and students responses on the benefits of the computer aided instruction were all above average. The responses include (i) improvement of interaction (ii) enhancing understanding of complex concepts (iii) improvement on student's concentration in class (iv)enhancing clarity and understanding of abstract mathematics concepts (v) increasing activeness in class by making lesson interesting (vi) motivating learners.

Campell and Cavannagh (2013) agree that teachers need to be trained in working with online tools such as mobile learning and interactive whiteboard and in authority digital learning resources. Teachers responses suggested that changes cannot be only about delivery professional development on logistic resources, instructional curricular

and organizational school factors must be identified at local levels and those issues negotiated with teachers so that changes become more possible. Teaching material based on computer aided instruction can be a solution to increased students learning outcome. Except that, teachers are anticipated to make instructional material by themselves to increase students learning outcome in extraordinary 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. (Grover 2012) added that the instructional material has a direct influence on students learning as the students interact with them.

5. Recommendations

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.

Computer classes should be made compulsory to all pupils and teachers and be used for instruction in all subjects. 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. (Grover 2012) added that the instructional material has a direct influence on students learning as the students interact with them. The findings of his research showed that fifty percent of fourth grade in the U.S.A do

math's problems from their text books daily, but instructional materials had an indirect path of influence on students learning via their effects on teachers.

Hansen and Williams (2008) also indicated that the method of instruction that is most effective in mathematics instruction is the use of visual representation, which is the use of manipulative, pictures, number lines, and graphs of functions and relationships to teach mathematics concepts. However, there is need for looking at the effects of a combined audio-visual media. Computer aided mathematics instruction does all the above.

Presnky (2008) had conducted two studies which concurred with the results of this research dissertation. The studies compared the use of overhead transparencies and the enhanced PowerPoint presentation over the use of overhead transparencies. He also articulated that students learned more when power point was incorporated into the instruction lesson. The researcher discovered that unrelated slides presentation leads to decrease in comprehension. Teachers have the task to prepare, choose the materials (the software's) to be used in integrating computer-aided mathematics instruction is determined by the availability computers in schools and the teacher's knowledge of using them.

Given the important role of teachers, it is crucial that teachers dispose of adequate knowledge for using computer technology effectively. Therefore, it is important that policy makers as well as the school senior management team invest both resources and time in the training of teachers. The results of this paper also suggest that policy makers can more actively encourage the use of ICT for schools with poor mathematics learning outcomes or with a diverse student population. As the ICT hardware is nowadays available in most of the schools, computer technology should be sued in the most effective and efficient way. This paper shows that adaptive computer aided instruction tools is an effective tool in increasing learning outcomes.

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