

Effects of Computer Interaction in Learning Strategy on Students' Achievements in Secondary School Mathematics in Murang'a County, Kahuro Sub-County, Kenya

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Abstract: *The growing need for technology advancement in developing countries is of paramount importance for developing countries to be fully developed. There is a great need to integrate the use of computer in their knowledge advancement. Mathematics is a strong tool for use in day to day life as an important tool for the existence of any individual in the society. It equips Learners with unique and powerful set of tools to understand the world and analyze the problems. Secondary school learners in Kenya have been performing dismally in their summative Examinations at the Kenya Certificate of Secondary Examination (K.C.S.E), a national examination administered after every four years of secondary education in Kenya. This ignominious performance is a great concern for all stakeholders in Education due to the importance need that they attach to Mathematics. According to (Mbacho and Bernard, 2013) There are a number of factors that attributes to the students' poor performance in the subject which includes, inadequate facilities in the schools like the study areas, text books, qualified teachers, failure to use visual aids when teaching, gender stereotype, lack of role models for girls, and the ineffectiveness instructional methods used by teachers. This study sought to find out if the use of computers interactive learning strategy during instructions of vectors and statistics in mathematics to form two students had effects on their performance. Vectors and statistics are topics that can be well illustrated by use of computers graphics and animations. There is however inadequate documented information in research conducted in Kenya on effects of the use of computers interactive learning strategy on students' achievement in mathematics. Solomon four non-equivalent control group research designs was used in the computer interactive learning strategy as treatment and two control groups were taught using the normal teaching method. A simple random sample of four well equipped district secondary schools with computers were selected from Kahurosub-county. The sample size was 210 students out of a population of a population of about 15000 students in the district. Achievement Assessment Test (AAT) was used for data collection. The instrument was validated and had reliability coefficient of 0.84. Data was analyzed using t-student distribution and ANOVA tests to show that learners taught using computer interactive learning strategy performed better than those taught using normal or conventional learning methods. The results also show that there was no significant gender difference in achievement when learners are taught using computer interactive learning strategy. Conclusions, implications and recommendations of the study are summarized.*

Keywords: Computer interactive learning; Achievement Assessment Test (AAT), Mathematics, Learners and Kenya Certificate of Secondary Examination

1. Introduction

Mathematics plays a key role in the society for entire development. There has been persistent dismal performance in the subject globally. In the United States of America (U.S.A) for example which is viewed as a global leader in many aspects, including Economy, Information technology, medical research, higher education, sports and scientific fields has lagged behind other countries of the world in learners' mathematics achievement as indicated by Trends in International Mathematics and Science Study (TIMSS, 2011). In Africa poor performance is also registered in mathematics. South African learners who participated in the 2007 TIMMS for example, were ranked last with a mean score of 351 which was lower than the international benchmark of 513. In Kenya, the performance in mathematics has continued to be very poor at the Kenya Certificate of Secondary Education (K.C.S.E) national mathematics examinations (K.N.E.C, 2012). The students' low mean scores in mathematics at K.C.S.E national examinations by gender in the years 2011 and 2012 are shown in Table 1.

Table 1: Students' Percentage Mean Score in Mathematics at KCSE for the year's 2011 and 2012

Year	Male	Female	Grand mean
2011	23.63	18.11	20.87
2012	25.75	19.71	22.73

Source: K.N.E.C, 2012

A report by the Kenya National Examinations Council indicated that national mathematics grand mean scores of 20.87% and 22.73% at KCSE during the years 2011 and 2012 respectively were below 25%. There has also been serious implication in that candidates lack admissions to careers in institution of higher learning for science related courses. Employers have also taken particular interests in this problem and criticized the school inability to teach mathematics effectively. For this reason parents have began to send students for private tuition in mathematics. The persistent dismal performance in Mathematics is also registered in Kahuro Sub-County (District) of Kenya where the study was carried out. The students' performance indices in mathematics out of twelve points at K.C.S.E in the years 2006, 2007, 2008 in the District were 2.93, 2.61, and 3.13 respectively. The underachievement and gender differences in learners Mathematics performance in Kenya is attributed to ineffective teaching methods employed in

Mathematics classrooms (O'Connor, 2000) among other factors. In Africa the factors attributed to learners' poor performance in Mathematics includes: inadequate teaching and learning resources; negative teacher/learner attitude towards the subject; and ineffective teaching methods (Miheo, 2012; Opolot-Okurot, 2005). Factors that contribute to poor performance in Africa in general and Kenya in particular are similar. There is therefore need for teaching strategies that arouse students' interest to learn Mathematics and hence improve the quality of outcomes in mathematics classrooms. This study therefore sought to find out the effects of the use of computers interactive learning strategy during instruction on learners' achievement in the topics Vectors and statistics that are taught to form two students in Kahuro Sub-County (District) of Kenya. Computers interactive learning strategy is a teaching strategy in which student are allowed to interact with computer visual graphic design or animations related to the topics of study. In the cooperative learning the class is divided into small group, each with students of different levels of ability, use a variety of learning activities to improve their understanding of subject matter (David & Roger, 2001). Each member of a team irresponsible not only for learning what is taught but also for helping team-mates learn, thus creating an atmosphere of achievement. Students work through the assignment until all group members successfully understand and complete it. Earlier studies have shown that learners who perform cooperative learning group tasks tend to have higher academic test scores, higher self-esteem, greater numbers of positive social skills, and greater comprehension of the content and skills they are studying (Johnson, Johnson & Holubec, 1993; Slavin, 1991). In this learning arrangement students work in-groups of 3 to 5 cooperatively to ensure their own learning and the learning of all others in their group (Johnson, Johnson & Holubec, 1993). This emphasis on academic learning success for each individual and all members of the group is one feature that separates cooperative learning groups from other group tasks (Slavin, 1991). To be successful in setting up and having students complete group tasks within a cooperative learning framework, a number of essential elements or requirements must be met (Cohen, 1992) which includes: a clear set of specific student learning objectives, clear and complete set of task-completion directions or instructions, heterogeneous groups, equal opportunity for success, positive interdependence, face-to-face interaction, positive social interaction behaviors and attitudes, access to must-learn information, opportunities to complete required information-processing tasks, sufficient time is spent learning, individual accountability, public recognition and rewards for group academic success, post-group reflection (or debriefing) on within-group behaviors according to Aronson (2000). Computers interactive learning strategy enables each student assigned to a group to interact with group members and visualize graphically the concepts that are attached to the learning topic.

2. Statement of the Problem

Over the years performance of mathematics in national examinations has been poor.

Table 2: Showing National mean score in mathematics 2007-2012

Year	2009	2010	2011	2012
Overall Mean %	19.73	19.31	18.60	15.96

The failure rate in KCSE examination as shown in table 2 above have been well above 50% year after year. There has been an outcry over mathematics performance after the release of KCSE examination results every year in Kenya. This performance in mathematics has also been witnessed in Kahuro sub-county in Murang'a County which is always lower than that of other Examined subjects. Roberston (1999) reported cooperative learning as a viable and effective instructional methodology for teaching and learning mathematics. It helps to make mathematics exciting and enjoyable for both students and teachers. Computer interactive learning strategies can be integrated at any grade level and for any mathematics topic. Students learn to cooperate with others and to communicate in the language of mathematics. The classroom atmosphere tends to be relaxed and informal, help is readily available, questions are freely asked and answered and even the shy students find it easy to be relaxed. Many students maintain a high level of interest in the mathematics activities and have an opportunity to pursue the more challenging and creative aspects of mathematics. Several studies have examined the effects of cooperative learning methods on student learning. Humphreys et al, (1982) compared cooperative, competitive and individualistic strategies in science classes and found that students taught by cooperative methods learned and retained significantly more information than students taught by the other two methods. This method of teaching has not been tried out in mathematics and learning in Kahuro sub-county in Murang'a County where performance in the subject has continued to decline. This study will aim at finding out the effects of Computer interactive learning strategies approach in the teaching of mathematics in the district. The use of Computer interactive learning strategies approach in teaching mathematics is likely to help improve the student's academic achievement. The available research does not indicate any research in the effects of Computer interactive learning strategies approach in secondary mathematics in Kahuro sub-county in Murang'a County. This study is therefore intended to fill this gap in the body of knowledge.

3. Purpose of the Study

The purpose of the study was to investigate the effects of using Computer interactive (cooperative) learning strategies approach on students' achievement in secondary school mathematics.

Objectives of the Study

The objectives of the study were:

1. To determine whether the Computer interactive learning strategies method is more effective than the regular methods of teaching with respect to academic achievement of students in mathematics.
2. To examine the attitudes the students have towards Computer interactive learning strategies as a method of learning mathematics.

3. To recommend for the improvement and promotion of suitable method of teaching mathematics to secondary school students.

Hypothesis of the Study

The following hypothesis was tested in this study at a significance alpha level of 0.05.

H_A: There is statistically significance difference in achievement in Mathematics between students who are exposed to Computer interactive learning strategies and those who are not exposed to it.

Significance of the Study

The aim of the study was to contribute towards the improvement of teaching and learning of mathematics at secondary school level. The knowledge of Computer interactive learning strategies in teaching and learning mathematics can encourage learner participation and effectively improve communication and interaction in secondary schools mathematics lessons. As a result the findings will add the existing knowledge of classroom research, hence and hopefully student performance will be improved. Specifically, the findings of this study will be significant to the following stakeholders.

a) Teachers

The finding will assist teachers to evaluate their teaching methods. While Computer interactive learning strategies is an instructional methodology is a good option for teachers, it is currently the least frequently used. More than 85% of the instructions in schools consist of lecturers, seatwork, or competition in which students are passive listeners. Goodland (1984) reported that most classroom time is spent in "teacher talk", with only 1% of the students classroom time used for reasoning about or expressing an opinion. This completely loses the weak learner especially in mathematics. Teachers will know when and how to improve students participation in the process of teaching and learning mathematics.

b) Students

Students on the other hand, have the responsibility of initiating classroom interactions for their proper understanding of mathematical concepts. Johnson and Ahlgren (1976) examined the relationships between students' attitudes towards cooperation, competition and their attitudes towards education. The result of the study indicated that student cooperativeness, and not competitiveness was positively related to being motivated to learn.

e) Teacher trainers

They will use the findings while preparing their secondary school mathematics teachers syllabuses. Teachers will be exposed to in-depth training that incorporates more of learner participation than the teacher. They will modify their training especially during micro-teaching skills. This will equip teacher trainees with appropriate skills to use during their mathematics teaching.

Assumptions of the Study

1. Teachers used in the study were well trained and have good mastery of the subject content.
2. There were adequate textbooks and other relevant teaching resources, for teaching the selected study topics.
3. The study groups were of similar learning backgrounds and that any learning outcome was as a result of the classroom experiences and interactions.
4. The selected secondary schools were well equipped with Computer facilities and the Graphical materials for the topics under study.

Delimitation of the Study

The study was delimited to:

1. Only four secondary schools of Kahuro sub-county in Murang'a County
2. Form two students in this study had between 250 marks-350 marks at KCPE level out of the possible 500 marks.
3. During the experiment the following topic will be covered.

- Vectors and statistics in form two.

Theoretical Framework

According to Slavin (1987), there are two major theoretical perspectives related to cooperative learning motivational and cognitive. The motivational theories of cooperative learning emphasize the student incentives to do academic work, while the cognitive theories emphasize the effects of working together.

Motivational theories related to cooperative learning focus on reward and goal structures. One of the elements of cooperative learning is positive interdependence, where students perceive that their success or failure lies within their working together as a group (Johnson, Johnson, & Holubec 1986). From a motivational perspective, "cooperative goal structure creates a situation in which the only way group members can attain their personal goals is if the group is successful" (Slavin 1990, P.14). Therefore in order to attain their personal goals, students are likely to encourage members within the group to do whatever helps the group to succeed and to help one another with a group task. There are two cognitive theories that are directly applied to cooperative learning. The developmental and the elaborative learning theories (Slavin, 1987). The developmental theories assume that interaction among students around appropriate task increases their mastery of critical concepts (Damon, 1984). When students interact with other students, they have to explain and discuss each other's perspective, which leads to greater understanding of the material to be learned. The struggle to resolve potential conflicts during collaborative activity results in the development of levels of understanding (Slavin, 1990). The elaboration theory suggests that one of the most effective means of learning is to explain the material to someone else. Cooperative learning activities enhance elaborate thinking and more frequent giving and receiving of explanations, which has the potential to increase depth of understanding, the quality of reasoning, and the accuracy of long term retention (Johnson, Johnson & Holubec, 1986). Therefore,

the use of cooperative learning methods should lead to improved student learning and retention from both the developmental and cognitive theoretical bases.

The Conceptual Framework

The conceptual framework (Figure 1) below of this study will be based on the systems theory developed by Ayot and Patel (1987) and Gerlach and Ely (1980) that portrayed the teaching-learning process as dynamic with inputs and

outputs with the assumption that teaching methods that involved students cooperation led to worthwhile learning (Hanrahan, 1998). The study will involve guided discovery in which teachers will play the key roles of planning and facilitating learning.

The framework is represented diagrammatically in the figure below.

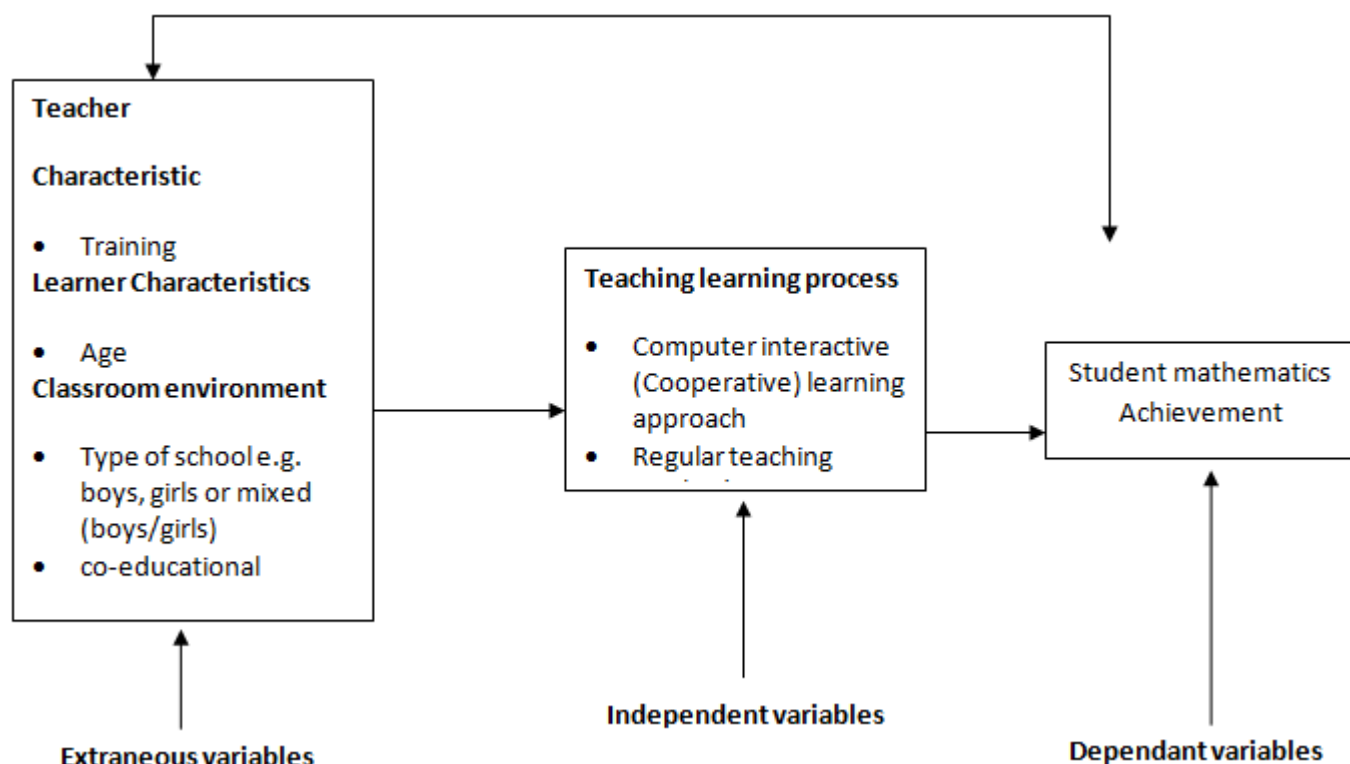


Figure 1: The Conceptual framework used to investigate the effects of computer interactive learning strategies on students Mathematics achievement.

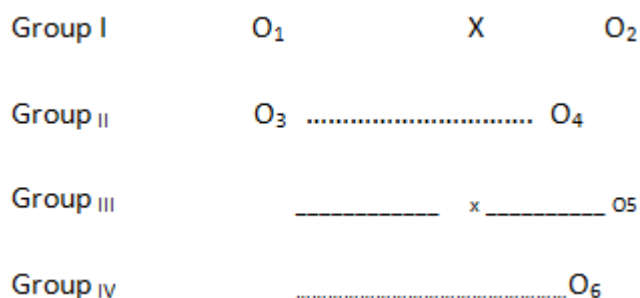
The figure above shows the relationship of variables for determining the effects of using computer interactive learning strategy on secondary students' achievement in mathematics.

Learning outcomes are influenced by various factors. These include; learner characteristics, classroom environment and teacher characteristics as shown in fig 1. These are the extraneous variables which will need to be controlled. Teacher training determine the teaching approach a teacher uses and how effective the teacher will use the approach. The learner's age and hence their classes determine what they are taught. The type of school as a teaching environment affects the learning outcome. The study involved trained mathematics teachers to control the teacher variable. The type of school used is co-educational to control the effect of the classroom environment. Form two students who are approximately of the same age were involved in the study. In the study therefore the teaching method that was used influenced the learning outcomes.

4. Materials and Method

Quasi- experimental research involving the Solomon's four non-equivalent Control Group Design was used. This is because there was non-random selection of students to the groups. Secondary school classes exist as intact groups and school authorities do not normally allow the classes to be dismantled and reconstituted for research purposes. (Borg & Gall, 1989; Fraenkel & Wallen, 2001). This design has advantages over others since it controls the major threats to internal validity except those associated with interaction and history, maturity and instrumentation (Cook & Campbell, 1979). The conditions under which the instruments were administered were kept as similar as possible across the school in order to control instrumentation and selection. The schools were randomly assigned to the control and treatment groups to control for selection, maturation and interaction (Ary, Jacobs, Razavien, 1979).

The following is a symbolic representation of the design.



Solomon Four Non- Equivalent Control group Research Design. Source: Fraenkel and Wallen (2000)

O₁ and O₃ will be pretests: O₂, O₄, O₅ & O₆ will be the post-test: X was the treatment where students were taught using cooperative learning approach. The dotted line implies involvement of intact groups. Group I was the experimental group which received the pretest, the treatment and the post-test Group II was the control group which received a pretest followed by the control condition and then a post-test.

Group III received the treatment X and post-test but did not receive the pretest. Group IV received the post –test only since it was a control group. Group I and III were taught using cooperative learning approach while group II and IV were taught using regular teaching approach.

5. Population of the Study

The target population was 15, 000 secondary school students in Kahuro Sub-County (District). The accessible population was form two Mathematics secondary school students in the District mixed-sex schools in Kahuro Sub-County (District) because the topic Vectors and Statistics is taught at this level (KIE, 2000) which is not an examination class. Twenty-seven (30) of the 36 District Schools were mixed-sex schools. The mixed-sex schools were used for this study because they are mostly disadvantaged compared to single- sex schools in terms of low achievement in mathematics. Kahuro Sub-County (District) was chosen for this study because of its dismal performance in mathematics and its proximity to the researcher.

Pilot Study

The instrument was pilot tested using a different school in the district but with similar characteristics as the sample school. This checked on the appropriateness of the data collection instruments and estimated the total time required by the respondents.

Validity

According to Wiersma(1995) analysis of time content, criterion and construct-related evidence through pretesting of study instruments validates the tools the validity of a measurement is the extent to which the instrument measures what it purpose to measure. The instruments were given to four senior examiners in K.C.S.E mathematics for validation. All the items were based on the text of the topic

taught to the sample students and all were adopted from past K.C.S.E examination.

Reliability

The variables that were used in the study are achievement and teaching styles (traditional method and cooperative learning method).The coefficient of reliability was determined through the use of Cronbach Alpha formula. This formula estimates the reliability of a test consisting of items on which different scoring weights may be assigned to different responses.

The following is Cronbach's alpha formula

$$\alpha = \frac{k}{k-1} \left(1 - \sum \frac{\alpha^2 i}{\alpha^2 x} \right)$$

Where k = the number of test items

$\alpha^2 i$ = The variance of scores on item i

$\alpha^2 x$ = The variance of scores on item x

The response from students' achievement tests was subjected to the alpha reliability test using the SPSS package.

Sampling Procedure and Sample Size

Simple random sampling was employed to selected four schools out of the possible 30 mixed-sex District schools in the District. Four schools were chosen because the Solomon 4 group design requires four groups. Each school formed a group in the Solomon 4 group design so that interaction by the subjects was minimized during the exercise. The assignment of groups to either experimental or control groups was done by simple random sampling. The classes used for the exercise were composed of approximately 40 students each. According to Mugenda and Mugenda (1999) the required size is at least 30 per group.

Instrumentation

The Achievement Assessment Test (AAT) was used to collect the required data. It was a 36item instrument that tested the student's knowledge, comprehension, application and mathematical skills on working out short answer questions that was set on all the subtopics of Vectors and Statistics. The total score for the instrument were 80 marks. These scores were distributed to 36 items. The items were allocated between 1 to 3 marks each. It was validated and had a reliability coefficient alpha of 0.87. Two schools, one experimental and the other control received a pre-test to enable the researcher to have knowledge of the entry level of the students before the experiment began.

6. Results

Pre- test Analysis

Prior to treatment, data was collected from the subjects in experimental group (E1) and control group (C1) using AAT to make it possible for the researcher to assess the

homogeneity of the groups before treatment application (Gall et al., 1996). Table 4 shows that-test pretest results obtained from groups E1 and C1 on the AAT.

Table 3: Pre-test mean scores on AAT and t-value results

Learning Method	N	Mean	SD	df	T-value	Sign
Experiment 1	38	16.47	11.72	74	0.879	0.382
Control 1	38	14.18	10.98			

* Statistically significant at 0.05

The results shown in Table 3 indicate that the differences between mean scores of groups E1 and C1 on the AAT was not statistically significant at the $\alpha=0.05$ significance level using the t-value. The P-value is greater than 0.05, an

indication that the groups were homogeneous and thus suitable for the study.

Table 4: Comparison of the Mean Score Gain Obtained in the AAT

Learning Method	N	Pre-test Mean	Post-test Mean	Mean Gain	df	t-value	p-value
Experimental 1	37	16.47	30.15	13.68	73	6.86	0.000*
Control 1	38	14.18	14.95	0.76			

*Statistically significant at 0.05.

Effects of the Computer interactive Learning Strategy on the Students' Achievement

The results presented in Table 4 show the students' AAT mean gain on E1 and C1 groups. Mean gain is the difference between the pretest and the post test score of the same group. The data indicated that the mean gain of the E1 group is 13.68 and the mean gain of C1 group is 0.76. Thus the mean gain of E1 group is higher than the mean gain of C1 group. Further statistical test using t-test at $\alpha = 0.05$

significance level (Table 4) also show that there is significant difference between the mean scores of the E1 and C1 groups ($P < 0.05$). This difference can be attributed to the Computer interactive learning strategy influence on the students' achievement on the Mathematics topics Vectors and Statistics. Table 5 shows post-test mean scores for the four groups and Table 6 shows results of ANOVA test on post-test mean scores.

Table 5: Students' post-test mean scores in the AAT Obtained by the Students in the Four Groups

Learning Methods	N	Mean	Std. Deviation	Std. Error
Experiment 1	37	30.15	16.56	4.440
Control 1	38	14.95	11.95	4.270
Experiment 2	42	33.79	13.58	3.923
Control 2	40	16.95	9.98	2.830
Total	157	24.27	13.01	2.225

Table 6: Comparison of Students' Post-Test AAT Scores using ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	10352.778	3	3450.926	19.671	.000*
Within Groups	27367.716	156	175.434		
Total	37720.494	159			

* Statistically significant at 0.05

The results presented in the Table 5 indicates that the post-test mean scores of the experimental groups (E1 and E2) are higher than the post-test mean scores of the control groups (C1 and C2). This is attributable to application of computer interactive teaching strategy to experimental groups. A further analysis using one-way ANOVA test shown in Table 6 indicated that there is a statistically significant

difference between the mean scores of the experimental groups and that of the control groups ($P < 0.05$). To show which pairs of groups had significant mean score differences, Scheffe's method of Post HOC tests of multiple comparisons was carried out yielding the results presented in Table 7.

Table 7: Post Hoc Comparisons of the AAT Post-Test Scores for the Four Groups

(I) FACTO RS	(J) FACTO RS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-15.2*	5.566	.000	-42.05	-10.50
	3	-18.84*	5.606	.015	-34.38	-2.60
	4	-2	5.740	.996	-14.83	17.71
2	1	15.2*	5.566	.000	10.50	42.05
	3	-3.64	5.477	.570	-7.74	23.31
	4	13.2*	5.615	.000	11.80	43.62
3	1	18.84*	5.606	.015	2.60	34.38
	2	3.64	5.477	.570	-23.31	7.74
	4	16.84*	5.654	.008	3.90	35.95
4	1	2.0	5.740	.996	-17.71	14.83
	2	-13.2*	5.615	.000	-43.62	-11.80
	3	-16.84*	5.654	.008	-35.95	-3.90

*. The mean difference is significant at the 0.05 level.

Factors

- 1 Control 1
- 2 Experiment 1
- 3 Experiment 2
- 4 Control 2

The results in Table 7 revealed that there is a statistically significant difference in mean scores between the experimental groups and control groups. The results also indicated that there is no statistically significant mean score difference between the two experimental groups or the two control groups. That is, the mean difference between E1 and C1 and E2 and C2, was statistically significant ($P < 0.05$). But the mean difference between E1 and E2 ($P = -4.21$) and C1 and C2 ($P = -2.03$) was not statistically significant. The main threat to the internal validity of non-equivalent control group experiments is the possibility that the group differences on the post-test may be due to initial or pre-existing group differences rather than to treatment effect (Gall et al., 1996).

7. Discussion

Students taught mathematics through the Computer interactive (cooperative) learning strategy performed significantly better than those who were taught through the conventional or traditional teaching methods. These findings support earlier studies that concluded that the use of the Computer interactive (Cooperative) learning strategy improved achievement scores compared to the conventional teaching methods (Hanze & Berger, 2007). The results further confirm Burns' (1984) assertion that Computer interactive learning strategy results is higher because learners engage in challenging tasks in their expert groups with enthusiasm because they know they have to convey the information when they move back to their respective small groups. The Computer interactive (cooperative) learning strategy makes learning interesting, it is highly interactive, students actively learn, and encourages students' responsibility in learning (Baird & White, 1984). This is necessary in order for them to develop a variety of problem solving techniques and to transform what they have learnt

for better use. Cooperative learning enhances social interaction which is essential to meet the needs of students and maintains trust among them (Slavin, Leavy, & Madden, 1989; Goodwin, 1999). Students assisted one another in the learning process and it was the duty of each member to make sure that other group members had mastered the concepts learnt in expert groups. The high achievers and low achievers learnt together because the activities required teamwork to accomplish. Each type of classroom reward structure in this learning arrangement promotes a different pattern of interaction among students (D'amico & Schumid, 1997). The cooperative structure in this study resulted in better achievement in the mathematics topics than the competitive and individualistic structures found in mathematics classrooms. It would be desirable therefore to implement this strategy in secondary school mathematics teaching.

4.1 Conclusion

Based on the findings of this study, which was carried out in District mixed-sex secondary schools of Kahuro sub-county in Murang'a County in Kenya, it was concluded that students who are taught mathematics topics using Computer interactive learning strategy performed better in the topics than those taught by use of conventional teaching methods.

4.2 Implications

The use of Computer interactive learning strategy in teaching results in better students' performance in mathematics. The Computer interactive learning strategy is therefore a suitable method for teaching. School Quality Assurance and Standards Officers in education should encourage teachers to use this strategy of teaching mathematics in order to improve the current trend of dismal performance in mathematics worldwide and especially in District schools of Kenya. The teacher training colleges and universities should emphasize Computer interactive learning strategy as an effective method of teaching mathematics.

8. Recommendations

It is recommended that Computer interactive learning/teaching strategy is introduced in teacher education programs made a requirement for practicing teachers as in-service courses for Mathematics teachers and be adopted by the Ministry of education and Kenyan Institute Education (KIE) as part of Mathematics curriculum. The government should also equip all schools with Computer (Laptop project) to ensure easier access of the facility. This would enable proper and easy implementation of the strategy.

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