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Differences in learner academic achievement in biology among students taught using computer assisted teaching strategy and those taught using traditional instructional strategies in secondary schools in Baringo county, Kenya

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Abstract
Achievement in Biology in Kenya Certificate of Secondary Education is low despite its significance in the society; this is demonstrated by the low performance scores of the learners in biology. The purpose of the study was to see if there were any differences in learner academic attainment in Biology amongst students instructed using a computer-assisted instructional method and those instructed using outdated methods in secondary schools in Baringo County, Kenya. The study used a Solomon Four –Quasi experimental design. In Baringo County, eight extra-county secondary schools were chosen using purposive sampling. The stratified random sampling approach was employed in the sampling school for the study. A total of 324 biology students were chosen from a stratified sample of extra-county secondary schools. Form three biology students were randomly selected and allocated to the experimental and control groups in selected schools with more than one stream. The investigational category were instructed by aid of a computer-assisted instructional means, whereas the regulator category received outdated instruction approach. As a research tool, the Biology Achievement Test was used. The research device was put through its paces to see how reliable it was. The dependability of the instrument was determined using the split half approach and the correlation coefficient was calculated using the Spearman Brown prophecy formula. The reliability coefficient of the research instrument was 0. 704. Frequencies and percentages were used to evaluate descriptive data, whereas Analysis of Variance and the t-test were used to assess inferential data. Computer aided teaching (CAT) was found to boost learner academic progress in biology when compared to outdated instructional methods. The outcomes of the study will benefit curriculum makers at the Kenya Institute of Curriculum Development in creating a framework and guidelines for integrating, planning, and the enactment of CAT in schools' curriculum, which will help to increase learner academic attainment besides motivation.

Keywords: academic, achievement, curriculum, biology, student, Baringo

Introductions
Biological science is a pre-condition for environmental science, health professions and pioneers in biotechnological development. Genetics is a branch of biology that utilizes is application to facilitate, resolve parental disputes and identify serious crimes in the society [9]. Biological concepts plays a keys crucial role in the life of human society to resolve challenges such as food shortages, medicine, and pest and disease control [23]. Laying the background for commercial agriculture a Backbone to the Kenya economy [7]. Biological knowledge has been applied to develop high yields and disease resistance, and increase food production through increasing maturity to meet food needs due to increasing population density [2]. Hence, biological knowledge plays an important role, making the improvement of academic performance worrying and motivating in biology in secondary education.
According to [3], academic success is an indicator of success that quantifies the degree to which learners have achieved in their educational aims as a result of an interactive session between the students and the teachers. The study performance is a measure of the learning or abilities acquired during the instruction process, as demonstrated by learners in after an assessment [24]. Therefore, academic accomplishment is a quantify of one's worth and success in mastering learning skills and ideas as measured by the normalized test. This has a great impact on the study performance, maintains and coordinates the behavior with respect

to the investigation performance of the students.

During the integration of CATS, computers are used that allow teachers to work at their own speed based on the hardware and software available [27]. Therefore, learners and teachers learn at their own pace and combine dynamic learning through CAT. The integration of CAI into the classroom enhances the learner's ability to hold concepts and improves the learner's performance on the subject by making learning interesting and presenting ideas with the help of sound and movement. Empirical studies on the integration of CAL on student performance in various subjects [6, 8, 26]. For example, [8] showed that CAL tools used in English classes had a higher average score for students because CAL had positive effects on student behavior and motivation, enabling them to learn more. Furthermore, CAL may be utilized to increase student skills in science courses like physics, biology, and chemistry, such as improved student performance in disciplines [6, 29]. CAL is seen as a means of school enhancement in United States of America. Biology is an important scientific subject in Kenya. Compared to other natural science subjects, their achievements have been poor in recent years, as can be seen from [11]. The outcome of research in biology is evaluated by homogenous or outcome tests. The poor performance of science, including biology, is a national issue, as highlighted in the 2005 Ministry of Education, Science and Technology Session Paper No. 1 [16].

Therefore, current educational strategies for example the use of computers in educational instruction need to be considered. This will improve academic performance and student motivation in biology. Despite these constructive discoveries from CAT strategies to improve learning performance and motivation, their effectiveness is not vividly comprehended. To bridge this mis-match, this study examined the differences in academic performance in biology between students taught and taught using computer teaching instruction and those taught using traditional method.

2. Materials and Methods

2.1 Location of the Study Area

The survey was undertaken in Baringo County, Kenya. The scientific results of KCSE, especially biology, which is a nationally representative sample, were consistently inadequate. Schools outside the school district with computers were selected for the survey. The sub county comprises of extra-county schools, mixed schools, private schools, private schools, county school and sub-county schools. In KCSE, especially in biology, which acted as a descriptive sample of the entire county, the county scientific achievements were low. Extra county schools were selected for research in which computer study is being examined.

2.2 Population of the Study

The populations of investigation incorporate secondary school biology learners in Baringo County. These population consisted of form three biology students from 85 secondary schools, and the target populace was 7,650 biology learners.

2.3 Sample Size and Sampling Procedures

A public secondary school in Baringo County equipped with a computer to integrate CATS into the classroom was screened with a special sample. The experimental school was divided into two parts. Only boys and girls. The selected sample schools were run according to the stratified random selection method. This method was carried out by voting, which was assigned a number to the school. The numbers got indicated on a small pieces of paper, folded and put into various pools representing the layers. As shown in the sample grid in Table 1, researchers randomly selected eight schools with the same proportions of four boys and four girls.

Table 1: Sampling Grid Table

School type	Number of school	Sample school	Total population	Experiment Group	Student Control group	Total
Boys only	38	4	145	64	80	144
Girls only	47	4	179	99	81	180
Total	85	8	324	163	161	324

In selected schools with many streams, random samples were used to obtain form three biology learners and assigned them the investigational and control groups. Simple random sampling were utilized to select a specific stream to aid in data analysis. 324 learners got involved in the exercise of this study and were divided into four categories from eight schools.

2.4 Research Instrument

Student performance and proficiency in biology subject matter, cell division was assessed by a biology performance test. The BAT test constituted of items from cell division subtopic. Short answer items and structured queries on the topic presented had 10 items. The pre-test was reorganized and used as a post-treatment test. This pre-test was performed in the investigational (E1) and regulator categories (C1) prior to the start of the course, and the latter was performed in all groups after the course. Pre-testing was aimed at testing learner proficiency and this understanding was the focus of the study. The test was piloted at high school with similar characteristics to the sample schools in the Baringo area. This was used to determine reliability. Items were evaluated according to a consistent evaluation structure and the scores obtained were documented and scrutinized.

2.5 Data Collection

The investigator accessed the schools, talked to students and faculty members, and asked for permission. The investigator used the manual to teach the instructors of the experimental group how to classify CAT materials. Cell division was a taught sub-theme of plant and animal reproduction. Teachers at all sample schools followed a common implementation plan. Prior to the start of the study, investigational category E1) and regulator category (C1) accomplished pretests, and thereafter, the CAT approach was performed for 2 weeks. The investigational categories (E1) and (E2) were instructed by utilization of computerized techniques, and the regulator category was instructed by aid of a typical instructional means. All four categories received

BAT tests and BMQs, which were scored and coded for data collection and analysis.

2.6 Data Analysis

The data collected was evaluated, coded and organized for scrutiny. Descriptive and inference statistics was used to analyze the data and test our research hypotheses. ANOVA was used to analyze the variations amid the four means and see if there were any significant variations amongst the four categories. T-test was utilized to determine the difference between the two means of the regulator category and the investigational category. Survey data were analyzed using the version of the Package of Social Science Statistics (SPSS) version 25.

3. Results

3.1 Respondents' Demographic Information

The respondents' demographic data was analyzed. The gender of the students was factored in as well. The investigational and regulator categories reported on gender distribution of respondents, and the results are provided in Table 2 for the investigational and regulator categories, respectively as illustrated in Table 2.

Table 2: Gender of the Respondent

	Experimental			Control
Gender	F	%	F	%
Male	64	39.3	80	49.7
Female	99	60.7	81	50.3
Total	163	100.0	161	100.0

From Table 2, 39.3% of the treated students in the study were male and 60.7% were female. On the other hand, 49.7% of the students exposed to traditional teaching methods were male, and the remaining 50.3% were female.

3.2 Effect of Computer Assisted Teaching on Academic Achievement in Biology

The purpose of this study was to investigate how computer assisted instruction technology affects the academic performance of participants in several categories. Using questions from the Biology Assessment Test (BAT) on cell division subheadings, the investigator evaluated learners' understanding, completeness, and application of the skills given in the subject. Participants were categorized into; regulator and investigational categories, where the investigational category learned CATS cell division and the regulator category learned the traditional approach. Preliminary studies were conducted in study category one and regulator category one. This was important so that investigator could measure group resemblance before starting treatment and compare the effectiveness of pre-testing with non-pre-testing. Finally, a post-test was used to determine the subject's proficiency. Group participants and post-test results were scrutinized and illustrated by aid of means, percentages and standard deviations. Table 3 illustrates the average outcome of BAT preliminary tests for the aftermaths of the investigational and regulator categories.

Table 3: Student Pretest Mean Score on BAT for Experimental group one and control group one

Pretest Group	N	Mean	Std. Deviation
Investigational (E1)	82	5.96	3.760
Regulator (C1)	74	11.34	6.779

The results were shown before the efficiency of a regulator category and an investigational category. The results showed that the mean value before the test of an investigational category was 5.96 having standard deviation of 3.760. Regulator category 1 recorded an average deviation of 6,779 before the test of 11.34. T-tests were used to check if the mean value before the test was significantly different. The results are presented in Table 4.

Table 4: t-test of Pre-test scores on BAT for experimental group one and control group one

Pre-test group	T	df	Sig. (2-tailed)
Investigational (E1)	14.364	81	.121
Regulator (C1)	14.296	73	.118

The results shown in Table 4 show that there is no significant difference between the mean values of the pretests in control group 1 (C1) and experimental group 1 (E1). t (81) = 14364, p = 0.121> 0.05, (C1). T (73) = 14.296, p = 0.118> 0.05. The difference in the mean pretest is not significant because P (0.121) and p (0.118) are greater than 0.05. This is an indication that these categories were relatively close. In other words, it included students who had similar characteristics for comparison and were suitable for research. Therefore, the academic performance of biology before CATS administration was comparable among the investigational category and the regulator category. The two categories were corresponding and therefore appropriate for investigation. In addition, there was need to find the average variations concerning academic performance among BAT students by associating the post-test averages of both investigational and regulator categories. The average student scores after the test in BAT are shown in Table 5.

Table 5: Posttest Mean Score on BAT for Experimental group one and control Group one

Group	N	Mean	Std. Deviation
Investigational category	82	15.23	3.325
Regulator category	74	11.20	2.321

The findings showed post-treatment progress in the regulator and investigational categories. The results showed that the post-test mean was 15.23 and the standard deviation was 3.325. After testing the control group, the mean was 11.20 and standard deviation was 2.321. The results showed that the average of the first test group after treatment for the test students was higher than the average of the first control group. Test analysis was performed on the dispersal of computerized educational strategies related to student progress in biology. The researcher helped calculate the

statistical difference amongst the two categories of students after the test.
The results are shown in Table 6.

Table 6: t-test of Posttest Scores on BAT for Experimental group one and Control Group One T Df Sig. (2-tailed)

Investigational category one (E1)	27.129	81.000
Regulator category one (C1)	17.896	73.000

*denotes significance at α=0.05

Table 6 show that there is a significant difference in post-investigational average amongst the first regulator category (C1) and the first investigational category (E1). The values t (E1) t (81) = 27129, (Cl) t (73) = 17896, and p = 0.000 were recorded. p (.000) is less than 0.05. This means that the variations amongst the averages after the investigational is large. This means that students' grades when teaching at CATS are statistically significant. This is because the average result of training students with computer-based learning strategies is usually better than that of traditional teaching methods.

4. Discussion

The results showed that the averages variations among the investigational and regulator categories was statistically significant in support of the investigational category, so the investigation found that the use of computer stimulation programs was more efficient compared to traditional teaching methods. These results are consistent with findings that the effects of computer stimuli in biology on student learning outcomes are quite significant [13]. This study revealed that the average score of group therapy accomplices exposed to computer stimulation was significantly greater as compared to participants not exposed to computer. These results are consistent with the results [27, 12, 14].
Their results conclude that utilization of computer-based learning generated a positive effect on student performance. The results of the study are consistent with the results of computer-assisted education on the learner performance [21]. Outcomes of this study showed a statistically significant increase in performance and problem-solving skills in an investigational category of computer science and engineering students. Therefore, automated learning strategies have proven to help students' grades [29]. Similar results were reported in a study examining the effects of computer-based instructional on biology education in Serbian primary schools.
The investigational category was instructed on biology (chordate) by use of CAL, and the regulator category learned the same with the conventional teaching method. Evaluation of work and retest outcome revealed that learners in the CAL category were significantly superior to the regulator category. Another study was conducted in line with the results of a study conducted in India on the use of Computer Assisted Instruction (CAI) and its effect on the advancement of educational approaches for biology education [20]. The investigational category was trained with CAI and the regulator category was trained in the conventional way. The findings revealed that the test category performed excellently compared to the regulator category.
Therefore, this investigation illustrates that using CAI enhances students' academic performance in biology than traditional strategies. The results of this study are consistent with a comparative study [10] conducted to assess the effectiveness of computer-based learning compared to direct computer science training. This study has shown that the mathematically taught investigational category performed exemplary than the pedagogically taught controller category. Consequently, CALs are highly efficient in boosting the judgment and applied skills of learners in investigational category trained according to teaching methods [15].
This study examined the impact of computer-based learning on the performance of general science students in comparison to outdated instructional methods. The results showed that the investigational category recorded better outcomes than the regulator categories in all functional areas, generally of interest in the cognitive domain and the nature of the student and stakeholder content which is supported by results of a study undertaken by [4] while investigating the effect of computer-based learning on the mathematical performance of high school students in Nigeria.
The results showed that the investigational category who learned mathematics using the CAL language was superior to the regulator category instructed by utilization of old-style methods. The mean value of the test group was higher than the mean value of the regulator category. These results showed that there was an average variations amongst the investigational and regulator categories. Therefore, the results revealed that the learning performance presented in CAL was superior to the learning performance of peers presented in outdated instructional methods. Similar results were reported by [19] in this study. In a study examining the impact of computer education on the performance of high school biology learners in Ghana, the same concept was conveyed using outmoded approach, resulting in more learners following the outdated approach in the test. It was shown that he was well taught. The dimensions of learners who received CAI training improved after CAI training, while those with dismal achievements in the investigational category improved.
The results of the study investigated the effect of CALs on the performance and attitude of college learners in analytical chemistry [1] and affirmed that performance of the investigational category was significantly greater compared with those of the regulator category. Similarly, if [5] and [17] teach acids, bases, electro-chemicals, carbons, or compounds thereof using CALs, the post-test results are statistically favorable to the above investigational category. It reveals that the incorporation of CALs. It will deepen students' understanding of the concepts of chemistry they accept and thus enhance their ability to work towards instructional approaches. It also agrees with the assumption that computational materials can improve chemistry learning [25]. The results of this study also provide CAL results [17] in high school chemistry learners. The results illustrates that in using CALs to teach acids, chemistry, carbon chemistry, carbon, compounds, the results in favor of the investigational category varied significantly, suggesting that CAL integration provides a abstract concept. The concept represents chemistry and enables learners to perform excellently when compared to outdated methods. These results are supported by the views of researchers, such as the study on improving science through computer-

based education for selected high school students in Kenya [18].

5. Conclusion

1. There was a variation in biology achievement amongst CATS learners and those instructed using old-style strategies.
2. The CATS strategy is useful because it enhanced students' academic performance than to outdated educational strategies.
3. Therefore, CATS complements traditional education strategies as it leads to higher academic performance than using traditional education strategies alone and allows students to learn faster and learn what they have learned.

6. Recommendations

Biology instructor ought to embrace CAT approach in biology as an instructional method in order to improve biology knowledge dissemination and improve academic performance in biology. When a biology teacher applies the CAT tactic in t classroom, he / she can improve the performance of biology at KCSE.

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