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Assessing the Role of Computer-Assisted Instruction and Mastery Learning Strategies in Shaping the Academic Achievement of Senior Secondary School Students in Computer Studies

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Abstract

This study assesses the role of computer-assisted instruction and mastery learning strategies in shaping the academic achievement of senior secondary school students in computer studies, in Ogun State. Pre-test and post-test non randomized quasi-experimental design were employed in the present study. Six schools were purposefully selected, with one intact class of students in each school, resulting in a total sample size of 393 students of both male and female. Data collection involved the use of a Computer Studies Performance Test (CSPT), which consisted of a standardized and validated test by the West Africa Examination Council (WAEC). The study utilized statistical means, frequency counts, and percentages to answer the research questions. In validating the research hypotheses, the study implemented an analysis of covariance (ANCOVA) test, keeping the significance level at 0.05 alpha. A significant positive effect of CAI and MLS on students' academic performance in computer studies was discovered. Moreover, no significant gender-based differences were observed in the treatment interaction on performance of students in Computer studies. The implications of these findings suggest that integrating CAI and MLS can enhance students' proficiency in computer studies. Therefore, it is recommended that these methodologies be introduced into secondary school curriculums.

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Introduction

The importance of information and Communication Technology (ICT) in student success across all education levels is paramount and cannot be overstated. According to Ogunlade (2015), ICT acts as a catalyst for transformation in institutions of higher learning. Given its global reach and pervasive internet use, ICT is effectively employed in various educational and learning contexts. The rise of ICT as a cornerstone in advancing the education sector across both developed and developing nations indicates its centrality in numerous countries' educational strategies. This is reflected in its pervasive use and implementation across many school systems, as Jerome et al. (2012) noted.

ICT holds the potential to tailor learning experiences to individual students' needs, boost self-efficacy and independent study practices, and contribute to overall student development. ICT fosters a cooperative learning environment that enables students to acquire more knowledge and skills through mutual interaction. Viewed as a robust instrument for educational transformation and reform, it supports traditional teacher-led instruction, enhances student-centred teaching methods,

and cultivates broad, general skills. Further, it facilitates rapid and easy access to expansive and up-to-date information. (Soetan et al., 2018).

The increasing demand for ICT literacy underscores the need for an intensified focus on computer study at every educational level, particularly in secondary schools. In 1988, Nigerian government integrated computer education into the secondary school system through the National Computer Policy. It is now known as 'computer studies', a subject accessible to both junior with their senior counterparts of Nigeria. The significance of computer education to nation-building and societal advancement at large is paramount. As Haruna (2014) asserts, no nation can aspire to progress without adopting computer technology.

Furthermore, an added benefit of computer science is the introduction of information literacy to students at an early stage. As Soetan and Ominuta (2018) explained, the necessity for information is a fundamental aspect of all human activity. It greatly factors into the improvement in education and forms the foundation for learners' knowledge growth, thus making it indispensable for educational progress. Computer education, in turn, fosters sustainable self-reliance opportunities for any nation.

In spite of the integral role that computer studies play in nation-building, performance of students at the level of secondary leaves much to be desired, as Nwanze (2014) reported. The West African Examination Council (WAEC) is a legally established examination board tasked with setting public interest examinations in English-speaking West African countries. Besides conducting these examinations, it also grants certificates that bear global equivalence to those conferred by similar examining authorities. WAEC's records from 2015 to 2022 consistently highlight subpar performance in computer studies. Table 1 captures students' performance at senior secondary school level in computer studies.

Table 1: Students Performance and the Statistics of Results in Computer Studies West African Examination Council (WAEC) in Nigeria, May/June 2015 – 2022.

Year	No. Reg.	No. Sat (%)	Grade A_1 (%)	Grade B_2: B_3 (%)	Grade C_4: C_5: C_6 (%)	Total (A_1-C_6) (%)	Grade D_7: E_8 (%)	Grade F_9 (%)	ABS (%)
2015	3818	3,818	0 (0%)	84 (2.2%)	818 (21.4%)	902 (23.62%)	1712 (44.84%)	1204 (31.53%)	0 (0%)
2016	5287	5047 (95.5%)	1 (0.01%)	172 (3.41%)	2037 (40.36%)	2210 (43.79%)	1443 (29.59%)	1394 (27.62%)	240 (4.5%)
2017	6276	5887 (93.8%)	2 (0.03%)	477 (8.10%)	1757 (29.84%)	2236 (37.98%)	1392 (23.64%)	2259 (38.37%)	389 (6.20%)
2018	6935	6525 (94.1%)	9 (0.13%)	650 (9.96%)	1990 (30.49%)	2649 (40.59%)	1513 (23.18%)	2363 (36.21%)	410 (5.91%)
2019	7498	7215 (94.1%)	35 (0.49%)	513 (7.11%)	2109 (29.23%)	2657 (36.83%)	3246 (44.99%)	1312 (18.18%)	283 (3.77%)
2020	8192	8192 (100%)	76 (0.93%)	695 (8.48%)	2627 (32.07%)	3398 (41.48%)	2282 (27.86%)	2512 (30.66%)	0 (0%)
2021	9203	9156 (99.49%)	120 (1.31%)	728 (7.95%)	1652 (18.04%)	2500 (27.3%)	3827 (41.8%)	2829 (30.9%)	47 (0.5%)
2022	9829	9819 (99.9%)	432 (4.4%)	873 (8.89%)	3253 (33.13%)	4558 (46.42%)	2871 (29.24%)	2390 (24.34%)	10 (0.1%)

Source: Ogun State Ministry of Education, Department of Planning, Research and Statistics (2023)

Less than half of the students consistently achieved a credit-level pass in computer studies as reported in the 2022 WAEC Examiner's Report. The Chief Examiner of the WAEC pinpointed instructional approaches as a contributing factor to this trend (WAEC, 2022). The multidimensional nature of computer studies education necessitates a variety of teaching strategies (Oluwele & Ahmed, 2015). Given the broad reach of computer studies across all academic tiers, it is clear that a one-size-fits-all teaching method is not feasible or effective. Different educational stages warrant unique teaching methods due to variations in student age, mental maturity, cognitive abilities, and understanding of computing concepts. Consequently, the teaching method suitable for primary, secondary, and higher education in computer studies must be tailored to suit students' specific needs and characteristics at each level. Moreover, acknowledging individual variations in learning styles and paces adds another layer of complexity to effectively teaching this subject.

To ensure the effective dissemination of computer studies knowledge, it is incumbent upon educators to approach their teaching duties with thoroughness and diligence, recognizing the subject's indispensable role in a student's daily life. Teachers should possess a robust foundation in computer studies and incorporate Information and Communication Technology (ICT) into their instruction for effective and efficient teaching. The didactic landscape has evolved beyond the traditional "chalk and talk" methodology, especially in the realm of computer studies education. The advent of ICT devices, visual and audiovisual aids, alongside an array of strategies of learning such as Mastery Learning Strategy (MLS), have revolutionized teaching approaches, ultimately enhancing learning outcomes.

Computer Assisted Instruction (CAI) represents an interactive teaching medium that harnesses the power of computers to deliver educational content and monitor associated learning outcomes. By integrating text, graphics, sound, and video, Computer-Assisted Instruction (CAI) enriches the learning experience (Onasanya et al., 2006). The utilization of computers in education enables students to develop communication proficiency, data-processing capabilities, problem-solving skills and decision-making abilities. Students can broaden their cultural understanding and perspective by leveraging the wealth of knowledge available online. CAI encompasses a wide spectrum of educational applications, ranging from instructional management, simulations, tutorials, drill and practice, database development, among others (Cotton, 2011). The research underscores the effectiveness of CAI. For example, Chang (2013) observed a significant increase in academic achievement scores when CAI was employed to teach arithmetic. This study exemplified how CAI can positively influence secondary students' abilities and realization. Additionally, students who engage with computer-based instructions typically demonstrate accelerated learning. Afolabi (2009) found that particularly in science-based subjects, CAI outperformed traditional methods in boosting students' academic achievement and retention. These findings align with others (Awofala et al., 2011; Anyamene, et al., 2012; Nwanne & Agommuoh, 2017; Onasanya et al., 2010) that attribute improved learning outcomes to learner-centered teaching approaches.

Mastery learning is a distinguished instructional approach that allows students ample opportunities to showcase their

understanding of the subject matter (Candler, 2010). The key distinguishing factor of mastery learning, as opposed to traditional teaching methods, is that it ensures the student understands a unit of material before proceeding onto the subsequent unit. This pedagogical strategy breaks down the learning material into manageable chunks, each with its specific objectives, enabling students to progress through the units systematically until they attain proficiency. It aids students in acquiring the necessary pre-requisite skills before advancing to the following unit. Mastery learning strategy frames the subject matter into discrete units, each with pre-set learning objectives. Students work either individually or collaboratively through each unit in a systematic manner. Teachers carry out comprehensive task analysis, equipping them to instruct the units better. Thus, learners are ensured maximum learning benefit from the instruction. Wambugu and Changeijwo's (2008) study discovered that students taught through the mastery learning strategy scored notably higher than their counterparts educated through traditional methods. his finding reinforces the notion that students' performance can be significantly enhanced through mastery learning.

The conventional system of teaching places the instructor at the center, often characterized as the "chalk and talk" approach. Adeniyi and Awofala (2023) reported that in this format, the teacher lectures, while students primarily receive information passively through listening and note-taking. The conventional method is described as a teacher-centric classroom environment, typically didactic, reliant on textbooks, and focused on examinations (Obeka, 2009). According to Kelly (2009), conventional educational practices primarily comprise the instructor orally communicating principles or notions. Within the framework of this conventional pedagogical approach, the educator undertakes the lion's share of activities, encompassing delivering lectures and inscribing notes on the board, positioning the learners mainly in the capacity of passive receivers. Onyezuligbo (2013) echoed this portrayal, observing that Nigerian science classrooms have remained tethered to these traditional teaching and learning patterns for decades. Michael (2012) added that factors such as substandard textbooks, which fail to engage students' interests, and a lack of computer technology in schools contribute to students' poor performance, decreasing achievement, and negative attitudes towards science subjects.

Gender is often a significant factor in computer studies education, with the subject frequently perceived as a predominantly masculine domain. Nonetheless, the relationship between performance and gender retains a degree of ambiguity (Awofala, 2017). Numerous studies have suggested a connection between gender and success in science subjects (Awofala & Awofala, 2012; Awofala, 2017; Akinsola & Awofala, 2009). Hyde and Mertz's (2009) revealed that female students' performance has achieved a level of equivalence with their male peers in computing studies, notably in high school where a prior disparity was evident. Their research indicates that girls are even surpassing boys in activities requiring complex problem-solving skills. Consequently, it's crucial to provide equal opportunities and challenges to both boys and girls in the computing learning process. Given this backdrop, the current study's objective was to examine the impact of CAI and the MLS on students' academic performance in computer studies, considering gender as a potential moderating factor.

Research Questions

Answers to these research questions were sought in this study:

1. What is the effect of computer assisted instruction and mastery learning strategy on student's performance in computer studies?
2. What is the influence of gender on the performance of computer studies students?
3. What is the combined interaction effect of gender, traditional teaching methods (TM), mastery learning strategies (MLS), and computer-assisted instruction (CAI) on students' performance in computer studies?

Research Hypotheses

Ho_1: There is no significant difference in the performance of computer studies students taught using CAI, MLS and TM

Ho_2: There is no significant difference between the performance of male and female students in computer studies.

Ho_3: There is no significant combined effect of gender, TM, MLS and CAI on student's performance in computer studies?

Methodology

This study adopted a quasi-experimental design utilizing pretest-posttest non-equivalent control groups in the context of quantitative research methodologies. The quasi-experimental design aids in variable identification. The instructional strategy and variables in the study were manipulated at 3 levels (MLS, CAI and TM) respectively. Gender, categorized as male or female, was introduced as a moderating variable. The study aimed to evaluate the impact of CAI, MLS, and TM on students' academic performance in computer studies.

The schematic representation of the study is as follows:

O_1 X_1 O_2
O_3 X_2 O_4
O_5 X_3 O_6

In this instance, O_1 O_3 O_5 denotes the pre-test, O_2 O_4 O_6 symbolizes the post-test. X_1, X_2, X_3 represent the treatments (CAI, MLS and TM). The mean difference of the scores were tested using ANCOVA.

The sample size for this study consisted of 393 SS II computer studies students, made up of 177 males and 216 females. Six secondary schools were purposively selected for the study. Two schools were assigned to each group (CAI, MLS, and TM) respectively. The study participants were selected from simple random sampling, with an intact chosen class in each selected school. Students' average age across the sample was 15 years.

The treatment instrument, a self-instructional interactive package known as Computer Assisted Instructional Package (CAIP), was employed to instruct the experimental group 2. This package included three lessons divided into modules covering program development, algorithms, flowcharts, and flowchart symbols. Developed using Articulate Storyline 360, the CAIP was published as a SCORM file and hosted on a Learning Management System (LMS) for smooth delivery.

The test instrument employed in this study was Computer Studies Performance Test (CSPT). This test, consisting of 20 multiple-choice questions with four options each, was adapted from validated and chief examiner-evaluated questions from the West African Examination Council's (WAEC) Computer Studies exam. The content is derived from a table of specification encompassing the six levels of cognitive domain of learning. This instrument was utilized for the pre-test and post-test phases across three groups: CAI, MLS, and TM. Divided into two sections, the CSPT not only obtains personal information

about the respondents—such as gender and school—in Section A but also assesses relevant academic competencies using 20 multiple-choice items in Section B.

Prior to the experiments, authoritative consent was procured from the leaders of the schools designated for the study. Once approval was granted, the experimental procedure commenced. Over the course of four weeks, the control group was instructed with standard traditional approach, whereas the mastery learning strategy and CAIP was utilized for the experimental groups. Although the lesson plans for all the groups covered identical topics, the mode of delivery differed. The control group followed routine traditional instructional computer study activities, including lectures and question-and-answer sessions to convey pertinent concepts. Classroom instruction for this group was scheduled for two 80-minute periods each week.

In Experimental Group 1, which primarily utilized the Mastery Learning Strategy (MLS) for instruction, the computer studies teachers received a thorough orientation on the underlying principles of the MLS instructional approach and the specific content areas of the study. They were encouraged to ask questions and suggest optimal ways to implement this modern teaching method in their respective schools. The teachers underwent two hours of training per day over a two-day period on the application of MLS, which was then evaluated through a Micro Teaching exercise designed to prepare them for MLS lessons. Each trained computer studies teacher guided their students' learning via the MLS instructional method, maintaining both the authenticity of the teaching and the integrity of the MLS classes. Mastery Learning Strategy implementation involves several procedural steps, including: establishing measurable educational objectives, forming efficient groups for cooperative student tasks, providing anchor tasks, monitoring students' progress diligently, offering additional support for struggling students. Each instructional plan in the MLS classes comprised an introduction, objectives, content presentation, evaluation, and conclusion. Following the Mastery Learning Strategy principles, the MLS group transitioned from one unit to another only when mastery of the subject matter was achieved.

For Experimental Group 2, utilizing the Computer Assisted Instruction (CAI) strategy, the intact classes from each school underwent training for two hours in a single day. This training focused on how to interact with the Computer Assisted Instruction Program (CAIP) for self-paced learning. The specific aims and nature of the study required the selection of schools with a strong Information and Communication Technology (ICT) inclination and adequate ICT resources for the study. Following a four-week period, the treatment processes were brought to a close across all the schools employing CAI, MLS, and Traditional Method (TM). Following this, the post-test, a restructured version of the pre-test, was administered to prevent any halo effect that could arise by being too familiar with the pre-test fieldworks.

The research hypotheses were addressed by employing inferential statistical methods, specifically the Analysis of Covariance (ANCOVA), tested at 0.05 alpha level. The achievement scores post-treatment were analyzed with ANCOVA, using the pre-treatment achievement scores as the covariate.

Results

RQ1: What is the effect of computer assisted instruction and mastery learning strategy on student's performance in computer studies?

Table 2: Effect of CAI, MLS and TM on Computer studies Student's performance

Treatment	*Pre-test*		*Post-test*		*Mean Difference*
	X	**SD**	**X**	**SD**	
MLS	13.02	3.028	18.65	1.768	5.63
CAI	12.93	2.041	19.16	2.863	6.23
TM	11.04	3.238	16.43	2.132	5.39
AVG. TOTAL	**12.33**	**2.769**	**18.08**	**2.254**	**5.75**

Table 2 illustrates the primary effects of CAI, MLS, and TM on students' performance in computer studies. The post-assessment outcomes indicate that CAI resulted in the highest average score (X = 19.16, SD = 2.863) and a mean difference of 6.23. This was succeeded by MLS, with a post-assessment average of 18.65 (SD = 1.768) and a mean difference of 5.63. Lastly, the Traditional Method exhibited the lowest post-assessment average (Mean = 16.43, SD = 2.132) and the smallest mean difference of 5.39. These results suggest that the computer-assisted instruction had the most significant effect on students' performance in computer studies.

RQ2: What is the influence of gender on the performance of computer studies students?

Table 3: Influence of Gender on Computer studies Students' performance

Gender	*Pre-test*		*Post-test*		*Mean Difference*
	X	**SD**	**X**	**SD**	
Female	13.78	3.028	18.12	2.548	4.34
Male	12.54	3.321	18.76	2.053	6.22
AVG. TOTAL	**13.16**	**3.175**	**18.44**	**2.301**	**5.28**

Table 3 showed the significant impact of gender on achievement in computer studies. It indicates that male students performed more proficiently, with a superior post-test average of 18.76 (SD = 2.053) and a mean variance of 6.22. On the other hand, female students demonstrated a lower post-test average, specifically 18.12 (SD = 2.548), and a mean discrepancy of 4.34. Thus, it's evident from the data that male students outpaced their female counterparts in the computer studies performance.

RQ3: What is the combined interaction effect of gender, traditional teaching methods (TM), mastery learning strategies (MLS), and computer-assisted instruction (CAI) on students' performance in computer studies?

Table 4: Combined interaction effect of gender and treatment on computer studies students' academic performance

Treatment	Gender	Pre-test		Post-test		Mean Difference
		X	SD	X	SD	
MLS	Female	14.39	2.828	17.33	2.048	2.94
	Male	13.82	3.181	17.78	2.353	3.96
CAI	Female	13.08	3.392	17.83	2.789	4.75
	Male	13.98	3.013	18.92	1.918	4.94
TM	Female	11.54	3.896	15.63	2.872	4.09
	Male	10.81	3.962	16.88	2.287	6.07

Table 4 showed the interaction effect of treatment types and gender on students' results in computer studies. For the CAI treatment, male students achieved the highest post-test mean score of 18.92 (SD = 1.918), while female students recorded the lowest with 17.83 (SD = 2.789). The data pertaining to the MLS treatment exhibited a similar pattern. Once again, the male students recorded the highest post-assessment average score of 17.78 (SD = 2.353), notwithstanding their lowest pre-assessment average score of 13.82 (SD = 3.181). The female students, on the other hand, possessed the lowest post-assessment average of 17.33 (SD = 2.048) and the lowest pre-assessment average of 14.39 (SD = 2.828). Finally, within the TM (Traditional Method) treatment, males continued to surpass females in post-test performance, presenting a mean score of 16.88 (SD = 2.287). This achievement was noteworthy, considering their lowest pre-test mean score of 10.81 (SD = 3.962). On the other hand, female students had the lowest post-test mean score of 15.63 (SD = 2.872) and a pre-test mean score of 11.54 (SD = 3.896).

Research Hypotheses

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HO_2: There is no significant difference between the performance of male and female students in computer studies.

HO_3: There is no significant combined effect of gender, TM, MLS and CAI on student's performance in computer studies?

Table 5: Analysis of Co-variance (ANCOVA) showing the effect of the treatments and gender on Computer studies Students' performance.

Source	Type III Sum of Squares		Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	73.217[a]	6	11.640	2.434	.043	.049
Intercept	5214.524	1	5214.524	1132.825	.000	.685
Pretest	.813	1	.813	.132	.889	.000

Treatment	39.783	2	17.783	3.667	.025*	.031
Gender	28.387	1	28.387	5.326	.030*	.019
G*T	5.427	2	2.582	.517	.587	.005
Error	1867.951	386	6.035			
Total	109851.000	393				
Corrected Total	1866.432	392				

a. R Squared = .049 (Adjusted R Squared = .033)

Table 5 highlights the fundamental influence of the treatment, the role of gender, and the joint effect of these factors on the students' achievement in computer studies. The table indicates substantial statistical differences in the average values across the three methods - MLS, CAI, and TM ($F(2, 391) = 3.667$, $p=0.025$, $\eta 2\ p = .031$). The evaluation was performed at a 0.05 significance level, suggesting a less than 5% likelihood that the observed result was a consequence of random chance. Therefore, there's a 95% chance that the variation in the responses to the treatments on the performance score represented a true discrepancy, not just a matter of coincidence. Furthermore, the partial eta squared (η 2 p) that signifies the share of the total variability (effect plus error) attributable to the effect, amounted to a negligible .031 in this analysis. This result indicates that the treatment factor independently accounted for a minimal 3.1% of the total variance in computing studies performance scores amongst students. As a result, the initial hypothesis was rejected, implying a significant influence of the treatment methods (CAI, MLS, TM) on students' academic performance in Computer Studies.

The second hypothesis examined in the research showed substantial differences in the average scores between the two genders ($F(2, 391) = 5.326$, $p=0.030$, $\eta 2\ p = .019$). Significance testing was conducted at the 0.05 level, implying a less than 5% likelihood that the observed results were random. Thus, with a 95% certainty, the observed discrepancy in the performance scores between male and female students represents a significant difference rather than a mere coincidence. Nevertheless, the partial eta squared (η 2 p) of .019 in this research signifies that gender by itself only explained a minor 1.9% of the total variance (effect + error) in students' performance scores in computer studies. Therefore, the second null hypothesis was rejected as well, affirming a substantial main effect of gender on students' academic performance in Computer Studies. Finally, the test for the third hypothesis detected that the observed combined influence of treatment strategy and gender on students' academic performance in Computer Studies was statistically insignificant ($F(2, 391) = 0.517$, $p=0.587$, $\eta 2\ p = .005$). Thus, the third null hypothesis was retained, suggesting there was no significant interaction effect of treatment method and gender on students' academic performance in Computer Studies.

Table 6: Computer studies Mean Score Treatment Comparison (Bonferroni)

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Errors	Sig[b]	95% Confidence Interval	
					Lower Bound	Upper Bound
MLS	CAI	-.689	.276	.044	-1.494	-0.003
	TM	.005	.323	1.000	-.657	.760
CAI	MLS	.689	.276	.044	.003	1.494
	TM	.702	.318	.089	-0.40	1.434
TM	CAI	-702	.318	.089	-1.434	0.40
	MLS	-.005	.323	1.000	-.760	.657

Based on estimated marginal means *. The means difference is significant at .05 level

Table 6 presents a post hoc test assessing the effects of the treatments—Computer-Assisted Instruction (CAI), Mastery Learning Strategy(MLS), and Traditional Method (TM)—on students' performance in computer studies. This examination aimed to identify which of these treatments were responsible for the significant improvements reported earlier. Findings show that both CAI and MLS played a significant role in enhancing the students' performance in computer studies, while the TM failed to make a similar contribution. Therefore, it can be inferred that using computer-assisted instruction and the mastery learning strategy led to significant enhancements in students' academic performance in Computer Studies.

Discussion

This study has determined that there is a significant primary effect of the treatments (CAI, MLS, TM) on students' academic performance in computer studies. This supports Duru's (2010) conclusion, which found that students taught science through the traditional method alone perform less effectively compared to their peers—exhibiting low achievement in science subjects. Furthermore, the results concur with research from Afolabi (2009), Yusuf and Afolabi (2010), and Awofala (2020), which asserted that CAI significantly enhances students' academic performance and retention. This study also aligns with research by (Lawal & Awofala, 2021; Awofala, 2017; Olabiyi & Awofala, 2019; and Tabassum & Farooq, 2011) which inferred that improvement in content learning was associated with teaching strategies that are centered around the learners. Traditional teaching methods have received criticism for their emphasis on teacher activities over student involvement, leading to a teacher-oriented approach (Awofala, et al., 2013; Adeniyi & Awofala, 2023). Additionally, it was noted that these methods negatively affect students' performance in computer studies. The research established that the application of both Computer-Assisted Instruction (CAI) and Mastery Learning Strategy (MLS) played a significant part in enhancing the students' performance in Computer Studies. This signifies an appreciable positive change in performance for students who partake in methods beyond the antiquated, traditional

"chalk and talk" teaching approach, which is increasingly regarded as obsolete. Thus, it can be concluded that both the CAI and MLS significantly boost students' academic performance in Computer Studies.

Furthermore, this research underscored the role of gender on students' academic outcomes in Computer Studies, with male students proving to excel more than their female counterparts. This outcome indicates an ongoing disparity related to the moderator variable—gender (Awofala, 2011b). Addressing this issue could involve the implementation of effective teaching strategies proven to mitigate such long-standing gender imbalances. It's noteworthy to recommend adopting strategies such as CAI and MLS for this purpose. Moreover, the results of this study align with those of Awofala et al. (2013), suggesting differing experiences between male and female students, extending beyond the classroom. This suggests that gender disparities in performance within Computer Studies might not have completely vanished (Awofala, 2017).

From the study, it can be inferred that there was no significant interplay between gender and the treatment methods in relation to their impact on students' performance in Computer Studies. This observation aligns with findings from Oluwele and Ahmed (2015), Anemelu (2012), and Tuatongba (2007), who reported no significant interaction effect of treatment and gender on students' performance in science subjects. Their results identified no significant interaction effect of the methods and gender variation in the mean achievement scores of students instructed using the CAIP. This conclusion is in agreement with the findings from research studies by Awofala & Nneji (2011), who discovered an insignificant combined effect of the teaching method and gender on students' educational results in science.

Conclusion

The outcome of this study underscores a significant primary effect of the treatments (CA, MLS and TM) on students' performance in computer studies. It was observed that both MLS and CAI significantly aided in improving students' performance in computer studies. Recommendations from the study suggest that strategies such as CAI and MLS should also be adopted to address the gender disparity, as these approaches have been proven effective for the task. Conclusively, it is evident that computer-assisted instruction and the mastery learning strategy significantly impact students' achievements in computer studies. The adoption of these strategies promises a dramatic shift and remarkable improvement in students' performance, moving away from the archaic "talk and chalk" teaching strategy, now deemed antiquated.

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