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Effects of Collaborative Team Teaching and Blended-Learning Instructional Strategies on Undergraduates' Academics Achievements in Information Communication Technology in Oyo State, Nigeria

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Abstract

Purpose: Low academic performance in information and communication technology (ICT) by Nigerian undergraduates has always been a concern, majorly associated with the conventional teaching-learning approach. This has led to worries about their employment readiness in a technology-driven world. The study focused on the effects of collaborative team teaching and blended learning instructional strategies on academic achievement of ICT undergraduates in Oyo state, Nigeria.

Methodology: The study used a quasi-experimental research design. Specifically, a pre-test–post-test non-equivalent control group design examined the impact of instructional strategies and gender on students' ICT achievement. Purposive sampling was used to select 300 second-year undergraduate students from three public universities in Oyo state. They were divided into three groups: collaborative team teaching (100 students), blended learning (100 students), and conventional instruction (100 students), which served as the control group. The study had one research question and one hypothesis. The undergraduates' achievement in ict test was used for data collection, with reliability calculated using the kuder-richardson 20 (kr-20) formula (0.83). Pre-test data were used as a covariate. Descriptive statistics analysed the data, while analysis of covariance (ancova) was conducted at the 0.05 significance level, followed by bonferroni post-hoc tests.

Findings: The results demonstrated that instructional strategies significantly affected undergraduates' ICT achievement. post-test scores for collaborative team teaching were significantly higher than those for blended learning and traditional instruction, with the highest score obtained through collaborative team teaching ($f(2,293) = 16.905$, $p < .001$, $\eta^2 = .103$). Blended learning also proved more successful than the traditional approach. However, the gender effect on undergraduates' achievement was not significant ($p > .05$).

Unique Contribution to Theory, Practice and Policy: The study is based on constructivist learning theory, social cognitive theory, and blended learning theory. The findings showed that undergraduates' ICT achievement was moderate and collaborative team teaching and blended learning significantly improved learning outcomes compared with conventional teaching. Both strategies were equally successful with male and female students. The study recommends that universities implement collaborative team teaching and blended teaching instructional strategies to improve undergraduates' ICT academic achievement. Lecturers should ensure that technology integration does not subject learners to gender-based inequality.

Keywords: *Collaborative Team Teaching, Blended Learning, Undergraduates' Academic Achievement, ICT*

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INTRODUCTION

The changes in education have resulted in the need to find new ways to teach so that students will have success in their educational program and on assessments. A new method of teaching might be especially effective for students who need to learn concepts and acquire hands-on skills, problem solving skills, and knowledge of how to use these skills in the development of new technology. ICT is one of the areas that is growing at a fast pace which calls for students to acquire both theory and practice. In the process, the traditional teaching model is gradually being supplemented and even replaced by more flexible and student-centred teaching model such as team cooperation teaching, blended teaching and the like.

With ICT making an impact in various aspects of life, the importance of effective ICT education in the higher institutions has become significant. Currently, ICT is used in almost all fields including education, health, commerce, finance, telecommunication, government and recreation. In the digital age, ICT has been more and more accessible and significant however, many undergraduate students still underutilize the potential of ICT for learning and development. Hence, there are concerns about the level of ICT Knowledge among the students as a lack of knowledge and skills in ICT may affect their ability to exhibit the knowledge and skills needed to be successful in today's society (Badmus & Olasedidun, 2017; Aselebe, 2021).

Aworanti (2016) and Okemakinde and Aselebe (2022) further pointed out that the ineffective use of ICT to facilitate education assessment is still constrained by the lack of ICT resources and lack of ICT knowledge of teachers and students in Nigeria. Furthermore, Adetimirin (2012) revealed that a lot of Nigerian graduates lack some digital skills to become productive employees. The lack of these skills will hinder their ability to secure jobs and to thrive in today's technologically driven, fast-changing job market.

It's not always easy to teach ICT as it requires the learner to acquire multiple areas of knowledge and skills including programming, networking, cyber security, and database management (Tucker, 2026). Many classrooms continue to be dominated by a lecture mode of teaching, with students sitting in front of a teacher and copying down information. It can help students to get the ideas across but sometimes does not give enough opportunity for students to practise, investigate and develop their problem-solving skills. Understanding a concept is not enough in ICT, students need to know how to use the concept in practice. Technology continues to evolve and students need to acquire new skills, think critically and problem solve to solve issues that they may face in the workplace. Therefore, ICT teachers should move beyond the classroom explanations in teaching and learning process. Furthermore, students need to be encouraged to participate in, work in groups with and brainstorm with others, to do hands-on activities, and to apply what they have learned to solve real-world problems.

The primary focus of this research is to investigate the effects of collaborative team teaching and blended-learning instructional strategies on undergraduates' academics achievements in information communication technology in Oyo state, Nigeria. The specific objectives include:

i. To investigate the gender differences in the undergraduates' Academics Achievements in Information Communication Technology in Oyo state, Nigeria

ii. To examine the significant main effects of treatments (collaborative team teaching, blended learning management system and traditional strategy) on Undergraduates' Academics Achievements in Information Communication Technology in Oyo state, Nigeria.

Research Question

1. Are there gender differences in the undergraduates' academics achievements in information communication technology in Oyo State, Nigeria?

Hypothesis

Ho1: There is no significant main effects of treatments (collaborative team teaching, blended learning management system and traditional strategy) on Undergraduates' Academics Achievements in Information Communication Technology in Oyo state, Nigeria?

Statement of the Problem

Although Information and Communication Technology (ICT) has become a vital subject in undergraduate education, students' attainment in ICT has become a problem especially regarding the acquisition and application of relevant knowledge and skills. In addition to being able to grasp the fundamental concepts of ICT, the undergraduates should acquire digital literacy, problem-solving skills, creativity, and the ability to use ICT in the real world. But, students' achievement concerns imply the need to investigate the teaching approaches to ICT. A possible reason is the continued use of traditional lecture-oriented teaching methods that could constrain the students' opportunity for active participation, collaborative interaction, hands on skills development and application of the knowledge of ICT. Lectures can be used to present the basic concepts but may not be sufficient to provide interactive and practice-like learning experiences that will facilitate meaningful learning of ICT. This situation highlights the importance of exploring new teaching methods, such as collaborative team teaching and blended learning, to create opportunities for interaction, knowledge sharing, active learning, and learning activities in the classroom and online.

In addition, a contextual gap exists on the effectiveness of collaborative team teaching and blended learning on the achievement of undergraduates in public universities of Oyo State, Nigeria in the context of ICT. The results of studies conducted in other schools cannot be directly applied to these schools, which would require further empirical studies to investigate the impact on learners' ICT achievement of these instructional strategies in this specific context. An additional factor to account for in the moderating effect of instructional strategies and the students' achievement in using ICTs is gender. Empirical studies on gender difference in digital learning and instruction with technology use are mixed. Some have reported gender differences in learning experiences, participation and achievement; others have found no gender differences. This is because the aforementioned inconsistencies lead to the need to determine if there is a difference between the effects of collaborative team teaching and blended learning on male and female undergraduates' achievement in ICT. With this background, the paper examines the effect of collaborative team teaching and blended learning instructional strategies on achievement of undergraduates' academics achievements in Information Communication Technology in Oyo state, Nigeria with focus on the moderating effect of gender.

Theoretical Framework

The theories used in this study are the theory of Constructivist Learning Theory (CLT) by Piaget (1977), Social Cognitive Theory (SCT) by Bandura (1986), and Blended Learning Theory (BLT) by Graham (2006). Constructivist Learning Theory focuses on the fact that learning is more effective when students do more learning activities, exchange ideas and interact with each other. The other perspective on learning, however, is Social Cognitive theory which focuses on the ways in which students learn from models of others, imitation, and feedback on performance. This view will enhance students' learning by seeing how others work and learning from their feedback. The theory that classroom learning can be blended with online learning so that students can learn at their own pace using digital materials, yet have face-to-face interaction with their teacher and classmate(s) is known as Blended Learning Theory. These theories can be integrated to provide a good basis for thinking about the effects of collaborative team teaching and blended learning on students' learning success in ICT. They also highlight the importance of designing learning activities and evaluations that enable learning both inside the classroom and outside of it; they view different learner and instructor needs.

The three perspectives complement each other in showing how collaborative team teaching and blended learning is helpful in improving the achievement of undergraduates in learning ICT. Piaget's Constructivist Learning Theory describes how students construct knowledge about ICT when they engage in concrete tasks, collaborate, and interact with their learning context and Bandura's Social Cognitive Theory describes how they learn and develop the skills required of ICT. The context for the learning process is made possible by Graham's Blended Learning Framework/Systems Approach and the integration of face-to-face and online learning experiences. In this mixed context students have opportunities to play an active role in building their knowledge through collaborative activities and to view instructors and peers modelling ICT-related activities, practising the models and asking for feedback via both physical and virtual means. Therefore, Piaget's theory of active construction of knowledge and Bandura's theory of observation and social learning are complementary theories for explaining the possible effectiveness of collaborative team teaching and blended learning in enhancing the students' achievement of ICT. Together, these perspectives offer the theoretical basis for analysing the impact of the two instructional strategies and the moderation effect of gender on undergraduates' ICT achievement.

Conceptual Clarification

Collaborative Teaching

Collaborative teaching is when two or more teachers plan, teach, and assess the learning of students together. This allows teachers to apply what they know, have done and are able to do in other contexts, to improve learning for the students. When teachers work with students, they can give students multiple perspectives, provide connections across disciplines in the lesson, and use different pedagogies to better enhance students' learning (Bolaji & Adesina, 2014). The advantages are not just limited to the classroom, however. Collaborative teaching provides teachers with the chance to exchange ideas, share their experiences and discuss how they can enhance their teaching methods. Moreover, Miller and Sorcinelli (2019) illustrate how teachers collaborating can develop

closer relationships, share learning, discover innovative strategies to assist students and enhance teaching.

Blended Learning

Blended learning is an approach to teaching and learning in the classroom, with some face-to-face instruction and some virtual instruction. Elmer and Carter (2016); Steingruber (2022) point out that this means that students could learn remotely anytime they wished, and yet receive the same personal interactions that they would receive in class. It also enables the teachers to use digital tools such as video, interactive simulations and virtual laboratories to make learning more practical and easier to understand. These digital tools allow ICT students more access to apply what they have learnt, experiment with ideas and to build skills for solving real world problems (Graham, 2021).

Academic Achievement

Academic achievement in Information and Communication Technology (ICT) is defined as how well undergraduate students develop, comprehend, remember and apply the knowledge and skills outlined in the ICT course curriculum. It represents students' comprehension of ICT concepts, digital literacy, problem solving in ICT, and their application in real-life situations. Academic achievement in ICT is defined as the score of the undergraduate students in the pre- and post-ICT Achievement Test developed by the researcher that measures their knowledge and understanding of the content areas of the ICT. The higher the score, the more successful the achievement in ICT. This operationalisation is similar to the use of tests and examination scores as objective assessment of the academic achievement of students (Steinmayr, Meibner, Weidinger & Wirthwein 2014; OECD, 2023).

Traditional Lecture Strategy

Traditional lecture strategy is a teaching method that is teacher-centered, where the teacher mainly presents, explains and transmits the subject to the students and the students mainly listen and take notes, and sometimes answer questions. This method focuses on verbal presentation and information delivery by the professor, and allows students' active involvement, cooperative learning and hands-on experience to be limited. In this study, traditional lecture strategy is defined as the instructional strategy that relies primarily on the presentation and explanation of the selected ICT topic by a lecturer, with the students taking notes and possibly asking questions, but not involving students in structured collaborative activities and the blending of online learning. This definition is similar to that of Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt and Wenderoth (2014) whose description of traditional lecturing is that the teacher was the one to lecture and most students' work was confined to taking notes and asking occasional questions.

Empirical Review

In recent times, empirical research has focused on the effectiveness of collaborative and technology-based instructional practices in affecting student academic outcomes in higher education. Omeh, Olelewe, and Nwangwu (2022) examined the effects of innovative pedagogy using context-based learning, problem-based learning and online teaching pedagogical tools such as Google Meet and Google Classroom on undergraduate computer programming students in

South-East Nigeria. The results showed that the students who were exposed to the innovative teaching model showed the advantages to the traditional teaching model in academic achievement, digital skills, and self-efficacy. Likewise, Elenwo and Wike (2024) studied the impact of team teaching on the learning outcomes of the undergraduates at Rivers State University and asserted that team teaching is relevant to students' learning. According to these research studies, co-learning opportunities through collaborative learning in the classroom can create opportunities for sharing knowledge, interaction and better learning among students at the university level.

Blended learning and learning management systems (LMS) were explored by Oguguo, Nannim, Agah, Ugwuanyi, Ene, and Nzeadibe (2021) in their study to examine the effect of LMS-supported instruction on undergraduate students' performance in Educational Measurement and Evaluation at Imo State University, Nigeria. They researched 232 students and delivered proof to the relevance of technology-supported instruction in university teaching and learning. In the same vein, Ohanu, Shodipe, Ohanu and Anene-Okeakwa (2022) studied the effect of the quality blended learning systems on the skills development of undergraduate students in post-secondary institutions in Nigeria. They highlighted the significance of the blended learning learning environment quality for students' involvement in technology-assisted learning. In addition, Odekeye, Fakokunde, Metu and Adewusi (2023) examined the perception of Undergraduate students of Learning Management System (LMS) and their academic performance during COVID-19 pandemic in Osun State University, Nigeria. The results showed that there were significant differences between the students' perception of the instruction supported by the LMS based on gender, level of study, and area of specialisation. The study also confirmed that LMS was seen as helpful to learn which knowledge gaps they have while preparing for class. All the above studies indicate the increasing significance of blended learning and LMS in higher education institutions in Nigeria, but there is a need to investigate its impact on achievement, particularly in undergraduate ICT education.

Empirical interest has also been paid to the impact of collaborative and technology-supported instruction on students' responses to it, with a focus on gender differences. The study by Muza (2020) looked at the effect of team teaching on the academic performance of undergraduate students at Kebbi State University of Science and Technology, Aliero. The results showed that the students who were taught by team teaching method performed significantly higher than the students who were taught by single instructor method, however, there was no significant difference between male and female students who were taught by team teaching method. Almasri (2022), on the contrary, studied the effects of e-learning, gender grouping and pedagogies on the attitudes and academic outcomes of undergraduate students in biology. The results showed that there were significant differences in academic performance between genders in various learning arrangements, indicating that technology-supported and collaborative learning can be more effective based on the learning environment and instructional methods. The results of these contrasting findings suggest a possible moderating variable of gender because it is not necessarily assumed that male and female students will have the same response when using collaborative team teaching and blended learning.

Research Gaps

The collaborative teaching and blended learning are applied in many learning fields, but their effectiveness in improving students' achievement in Information and Communication Technology

(ICT) still needs to be explored. The results of these approaches have been found to be beneficial in the past, including increased student engagement, retention of knowledge and analytical skills (Dziuban 2018). However, further studies are required to elucidate the effectiveness of the strategies in ICT education especially in the undergraduate level in Nigeria. The present study, therefore, examined the effect of collaborative team teaching and blended learning instructional strategies on academic achievement of ICT Undergraduates in Oyo state, Nigeria.

METHODOLOGY

The study utilized a pretest-posttest non-equivalent control group quasi-experimental design. It focused on 200-level undergraduate students from public universities in Oyo State, Nigeria. To gather participants, a multistage sampling procedure was implemented. First, we used stratified sampling to choose three public universities in Oyo State, which included one federal university and two state universities. Next, a purposive sampling technique helped us select the Faculty of Social Sciences, from which we picked one department. This resulted in a total of three hundred participants: one hundred and one from Treatment Group I, one hundred from Treatment Group II, and one hundred from the control group. To assign participants to these groups, we employed a simple random sampling technique. The study's instruments included three stimulus tools and one response tool: the Collaborative Team-Teaching Instructional Guide (CTTIG), the Blended-Learning Instructional Guide (BLIG), and the Conventional Instructional Guide (CIG) served as the stimulus instruments, while the Undergraduates' Achievement in Information and Communication Technology Test (UAITT) was the response instrument. Trained research assistants used the stimulus instruments during the treatments at three different levels, and the response instrument was given as both a pretest and a posttest. The researchers spent two weeks training the research assistants on how to use the treatment packages. After this training, the pretest was administered over a week, followed by an eight-week treatment period. At the end of these eight weeks, posttests were conducted with the study participants. Data were gathered through a response instrument, specifically a multiple-choice achievement test known as the Undergraduates' Achievement in Information and Communication Technology Test (UAITT). The instrument was verified by experts in the relevant fields, and its reliability was established using the Kuder-Richardson Formula 20 (KR-20), which yielded a coefficient of 0.83. Descriptive statistic was used to answer the research question, while Analysis of Covariance (ANCOVA) was employed to test the hypothesis at the 0.05 level of significance.

RESULTS

Research Question**:** Do male and female undergraduates differ in the academic achievement in Information Technology in Oyo State, Nigeria?

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Table 1: Gender Differences in the Undergraduates' Achievement in Information and Communication Technology

4. Treatments_grps * Gender		
Dependent Variable: Postachiev_scores		
Treatments_grps	**Gender**	**Mean**
Blended Learning Strategy	Male	35.940[a]
	Female	35.517[a]
Collaborative Team Strategy	Male	36.163[a]
	Female	35.984[a]
Control Group	Male	33.254[a]
	Female	33.635[a]
a. Covariates appearing in the model are evaluated at the following values: Preachiev_Scores = 27.61.		

Table 1 indicates no meaningful gender difference in the Undergraduates' achievement in Information Technology in Oyo State, Nigeria. The results showed that male and female students achieved nearly identical post-test scores across all treatment groups; while males had slightly higher mean scores in the blended (35.94 vs 35.52) and collaborative groups (36.16 vs 35.98), females marginally outperformed males in the control group (33.64 vs 33.25), and the differences were insignificant and not in any consistent direction. This suggests that both genders benefited equally from the instructional strategies employed in the study.

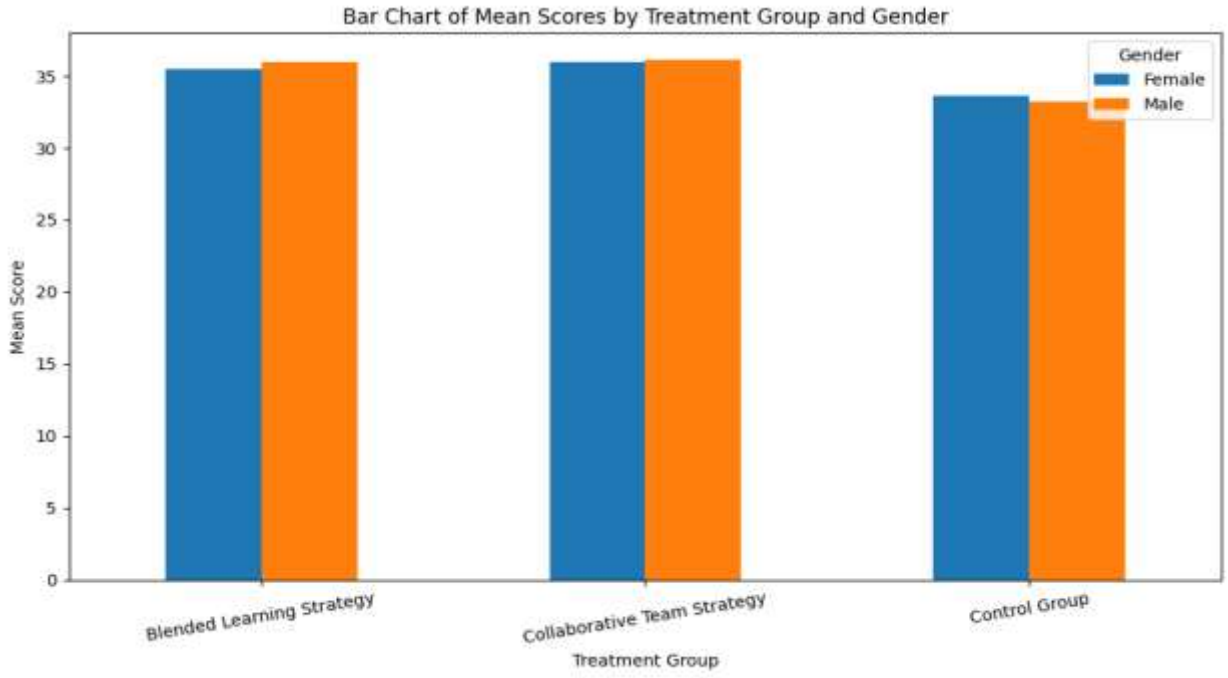


Figure 1: Gender Differences in the Undergraduates' Achievement in Information and Communication Technology in Oyo State, Nigeria

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According to Figure 1, male students had a higher average achievement score in both the blended and collaborative treatment groups. On the other hand, female students outperformed their male counterparts in the ICT group, achieving a higher mean score.

Hypothesis Testing

Ho1: There is no significant main effect of treatments (collaborative team teaching, blended learning management system and traditional strategy) on Undergraduates' academics achievement in Information Communication Technology in Oyo state, Nigeria?

Table 2: **Analysis of Covariance of effect of treatments on Undergraduates' Post-achievements in Information Communication Technology**

Tests of Between-Subjects Effects

Dependent Variable: Postachiev_scores

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	684.975[a]	6	114.162	14.637	.000	.231
Intercept	7663.538	1	7663.538	982.581	.000	.770
Preachiev_scores	646.138	1	646.138	82.845	.000	.220
Treatments_grps	263.702	2	131.851	16.905	.000	.103
Gender	.399	1	.399	.051	.821	.000
Treatments_grps * Gender	8.356	2	4.178	.536	.586	.004
Error	2285.222	293	7.799			
Total	372503.000	300				
Corrected Total	2970.197	299				

a. R Squared = .231 (Adjusted R Squared = .215)

The Table 2 ANCOVA results show that treatment has a significant main effect on students' post-achievement scores. Specifically, the treatment variable yielded: • $F_{(2, 293)} = 16.905$ • $p = .000$ ($p < 0.05$) • Partial Eta Squared (η^2) = .103

Since the p-value is less than 0.05, we reject the null hypothesis. This indicates a significant difference in academic achievement among students who experienced various instructional treatments. This finding suggests that the instructional strategies used, such as Collaborative Team Teaching, Blended Learning, and the Conventional Method, significantly affected students' academic achievement in ICT. In other words, students did not perform the same across the treatment groups; at least one instructional strategy resulted in better academic achievement than the others. The partial eta squared ($\eta^2 = .103$) shows a moderate effect size. This means about 10.3% of the differences in students' post-achievement scores can be linked to the treatment effect, controlling for pre-achievement scores. This indicates that the treatment is both statistically significant and educationally meaningful.

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Table 2: Bonferonni PostHoc Analysis of the Effect of Treatments on Undergraduates' Post-Achievement Scores in Information Communication Technology

Dependent Variable: Postachiev_scores						
(I) Treatments_grps	**(J) Treatments_grps**	**Mean Difference (I-J)**	**Std. Error**	**Sig.[b]**	**95% Confidence Interval for Difference[b]**	
					Lower Bound	**Upper Bound**
Blended Learning Strategy	Collaborative Team Strategy	-.345	.399	1.000	-1.305	.615
	Control Group	2.284*	.489	.000	1.106	3.463
Collaborative Team Strategy	Blended Learning Strategy	.345	.399	1.000	-.615	1.305
	Control Group	2.629*	.464	.000	1.513	3.745
Control Group	Blended Learning Strategy	-2.284*	.489	.000	-3.463	-1.106
	Collaborative Team Strategy	-2.629*	.464	.000	-3.745	-1.513
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
b. Adjustment for multiple comparisons: Bonferroni.						

From the post-hoc table above, it shows specifically that collaborative team teaching produced significantly higher academic achievement compared with blended learning and conventional instructional strategies. This finding is in line with studies which indicate that collaborative instructional approaches significantly enhance students' academic performance, engagement, and learning motivation (Tadesse, 2024). Furthermore, collaborative teaching models provide multiple perspectives in classroom instruction and allow educators to address complex topics more effectively, thereby improving learning outcomes (Laura, 2024).

Discussion

The study indicated that there was no significant difference between the academic achievement of the undergraduate students in the ICT field based on gender. There were no significant differences across genders in achievement for the various treatment groups, indicating similar teaching conditions and amounts of learning for both sexes. The results indicate that gender might play a minor role in students' achievement in ICT when they are taught in an inclusive and supportive setting that is conducive to active learning. This is in line with Kay et al., (2018) and Soll et al., (2021) who have shown that gender gaps in ICTs skills are relatively small and context specific. Similarly, the need for equity and inclusion in teaching and learning for inclusion and equal participation of learners has been emphasised in previous research (Traxler & Riordan, 2003; UNESCO, 2017). The gap in ICT performance might also be attributed to the availability of ICT, confidence in and prior experience with ICT, and not to gender (Cooper, 2006; Volman & Van

Eck, 2001). The results of this research confirm the need to provide equal opportunities for boys and girls to acquire ICT knowledge and skills through teaching methods.

The results of the hypothesis testing indicated that the teaching methods had significant effect on students' academic achievement. Students instructed by collaborative team teaching had the highest achievement scores, students instructed by blended learning had the second achievement scores, students instructed by conventional teaching had the lowest achievement scores. This finding confirmed previous studies which had reported that collaborative teaching had a positive effect on students' performance, motivated them to actively engage in learning and increased their interest (Abdullahi and Lawal, 2023; Bolaji and Adesina, 2014; Elenwo and Wike, 2024; Tadesse et al., 2024). Another reason might be that when working with peers and teachers, students are able to be exposed to other thoughts, others may ask them questions they need to clarify or learn from, and get ideas from others. Blended learning also seems to have advantages due to the integration of face-to-face learning with online learning, enabling students to access learning materials in a flexible manner and learn according to their own speed (Bonk & Graham, 2006; Chikh, 2024; Dziuban et al., 2018; Graham, 2021; Kang & Kim, 2021; Obadara, 2021; Rungrudesombatkit & Rungrudesombatkit, 2024). The study result can be explained from a constructivist, social learning and connectivist viewpoints which focus on human involvement, social interaction and connecting with numerous knowledge sources during the learning process (bandura, 1986; shih, 2025; siemens, 2005; colelli et al., 2025).

Conclusion and Recommendations

The study revealed that the academic achievement of male and female learners was not significantly different, meaning that the teaching methods had a similar effect on boys and girls. The collaborative team teaching achieved the best results in terms of achievement score, and the blended learning was more effective than the traditional teaching method. The following recommendations are made based on the results of this research:

- Implement collaborative team teaching and blended teaching in university to enhance the academic achievement of undergraduates in the learning of ICT.
- Lecturers should make sure that the application of technology in teaching does not create any gender inequality in learning, as the results indicated that there was no significant difference in academic achievement across genders.

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