

Differential Effects of Active Learning and Culturo-Techno-Contextual Approach (CTCA) on Pre-Service Teachers' Achievement and Interest in Business Education

Gatta Saheed Alade, Olafare Festus Oladimeji and Falobi Oluwole Victor
Department of Technology and Vocational Education, University of Lagos

Abstract

This study examined the effects of Active Learning and the Culturo-Techno-Contextual Approach (CTCA) on pre-service teachers' achievement and interest in Business Education in Southwest Nigeria's Colleges of Education. Using a quasi-experimental pretest-posttest design, 107 pre-service teachers and 8 lecturers from three colleges were assigned to CTCA (n=42), Active Learning (n=31), and Control (n=34) groups. Data from the Business Education Achievement Test (BEAT) and Interest Inventory (BEII) were analysed using ANCOVA. Lecturers viewed active learning positively, though challenges with error recovery and pleasantness emerged. CTCA recorded the highest achievement gain (6.62), followed by Active Learning (4.39) and Control (3.53). For interest, Active Learning led (3.93), followed by CTCA (3.83) and Control (3.64). Gender showed no significant main effect on achievement, but a significant treatment-gender interaction existed. CTCA significantly outperformed other groups in achievement, while both CTCA and Active Learning enhanced interest more than conventional methods. CTCA is recommended for achievement, Active Learning for interest, alongside targeted professional development.

Keywords: Achievement, Active Learning, Business Education, Colleges of Education, Culturo-Techno-Contextual Approach (CTCA), Gender, Interest

Introduction

Business Education occupies a strategic position within the framework of technical and vocational education, serving as a critical pathway for equipping students with entrepreneurial, employability, and global economic competencies. In Nigeria, Business Education is primarily delivered in Colleges of Education, where it prepares pre-service teachers for teaching at secondary and vocational levels. The effectiveness of this preparation depends substantially on the pedagogical approaches employed in teacher training programs, as pre-service teachers are expected not only to master business content but also to develop instructional competencies necessary for fostering meaningful learning in their future classrooms (Olafare, Falobi, & Gatta, 2025).

Despite the recognized importance of Business Education, persistent reliance on traditional lecture methods has been widely documented across higher education contexts (Theobald et al., 2020). This teacher-centered approach, characterized by one-way transmission of information, has been linked to passive learning, poor knowledge retention, and suboptimal outcomes among pre-service Business Education teachers (Olafare et al., 2025). The limitations of conventional pedagogy are particularly concerning in business disciplines, where students need to develop critical thinking, problem-solving, collaborative, and communication skills essential for professional practice (Vega & Crisol, 2020).

In response to these pedagogical challenges, active learning strategies have gained prominence. Active learning engages students in the learning process through meaningful activities that require them to do more than passively receive information (Du, Chaaban, Sabah, Al-Thani, & Wang,

2020). Research has demonstrated that active learning methodologies significantly enhance academic achievement, promote deeper conceptual understanding, and foster greater student engagement. A meta-analysis by Theobald et al. (2020) found that active learning reduced achievement gaps in examination scores by 33% and narrowed gaps in passing rates by 45% compared to traditional lecturing. Furthermore, active learning increases student interest and motivation (Owens, Sadler, & Barlow, 2020) and enhances creative thinking, communication, and social interactive skills (Vega & Crisol, 2020).

An emerging pedagogical innovation that has garnered significant attention in African educational discourse is the Culturo-Techno-Contextual Approach (CTCA). Developed by Professor Peter Akinsola Okebukola, CTCA is a home-grown teaching model that emphasizes the integration of students' cultural background, available technology, and the context of the learner's environment to facilitate meaningful learning (Okebukola, 2020). The cultural environment is paramount, since students process issues from their cultural perspective before absorbing other perspectives (Okebukola, 2020). The technological component involves using digital tools such as YouTube, Google, computers, and mobile phones to search for cultural information, while the contextual component situates concepts within the learner's environment (University World News, 2020). CTCA has been described as an efficient active learning model of African origin offering a culturally responsive alternative to Western pedagogical models (Awaah, Lambini, & Ekwam, 2020). Research has demonstrated CTCA's potency in improving student achievement, reducing learning anxiety, and promoting meaningful learning across various subjects including chemistry, computer networking, and biology (Okebukola, 2020; Adolo, 2020).

Despite growing evidence supporting both active learning and CTCA as effective pedagogical approaches, limited research has comparatively examined their differential effects on pre-service teachers' learning outcomes in Business Education. While active learning emphasizes student participation through problem-solving and collaborative tasks, CTCA offers a culturally grounded framework that leverages indigenous knowledge systems and local contexts to enhance understanding (Olafare et al., 2025). Understanding the relative effectiveness of these approaches on cognitive outcomes (achievement) and affective outcomes (interest) is crucial for informing pedagogical decisions in teacher preparation programs.

Preliminary evidence revealed that CTCA produced the highest mean gain in achievement (6.62), followed by active learning (4.39), while the control group recorded the lowest (3.53) (Olafare et al., 2025). However, the differential effects of these approaches on student interest remain underexplored, and the potential trade-offs between maximizing cognitive versus affective outcomes warrant further investigation. Additionally, while lecturers perceive both CTCA and active learning as useful and effective, areas for improvement have been identified (Olafare et al., 2025).

The present study, therefore, seeks to investigate the differential effects of Active Learning and the Culturo-Techno-Contextual Approach (CTCA) on pre-service teachers' achievement and interest in Business Education in Colleges of Education. By comparing the relative effectiveness of these two innovative pedagogical approaches on both cognitive and affective learning outcomes,

this study aims to contribute empirical evidence that can inform curriculum reforms, guide professional development initiatives for Business Education lecturers, and support the integration of culturally responsive and participatory teaching approaches aligned with 21st-century pedagogical demands.

Statement of the Problem

Business Education is fundamentally designed to produce competent, creative, and critically thinking pre-service teachers capable of navigating complex economic environments and effectively imparting practical entrepreneurial and vocational skills to future secondary school students. To achieve these objectives, contemporary pedagogical literature advocates for innovative, student-centered methodologies that foster deep conceptual understanding, collaborative skills, and sustained student engagement. However, the current reality within many Colleges of Education presents a stark contradiction to this ideal. Business Education classrooms remain overwhelmingly dominated by traditional, lecture-based, teacher-centered instructional methods. This persistent reliance on passive transmission models has been linked to superficial learning, poor knowledge retention, diminishing academic achievement, and declining student interest among pre-service teachers. When students are consistently relegated to the role of passive recipients of information, their intrinsic interest, curiosity, and motivation toward business subjects steadily decline, undermining the very essence of vocational and entrepreneurial training.

In response to these pedagogical challenges, two innovative approaches have emerged as promising alternatives: Active Learning and the Culturo-Techno-Contextual Approach (CTCA). While the general benefits of these approaches are increasingly acknowledged, a significant empirical gap exists regarding their comparative effectiveness on both cognitive and affective learning outcomes within Business Education in Colleges of Education. Evidence suggests that CTCA may yield higher achievement gains, while Active Learning may produce greater improvements in student interest, yet these differential effects remain insufficiently explored. Additionally, the influence of gender and lecturers' perceptual frameworks on the effectiveness of these approaches has not been adequately examined. Therefore, this study investigates the differential effects of Active Learning and CTCA on pre-service teachers' achievement and interest in Business Education, examining the moderating influence of gender. By comparing these innovative pedagogical approaches across both cognitive and affective learning outcomes, this study aims to provide evidence-based insights necessary for curriculum reforms, professional development initiatives, and policy formulation that can ultimately enhance the quality of Business Education and better prepare pre-service teachers for their future roles as effective educators.

Purpose of the study

The major purpose of the study is to investigate the effect of Culturo-Techno contextual Approach (CTCA) and active learning strategy on pre-service teachers learning outcomes in Business education in colleges of education. Specifically, will.

1. Investigate how Business Education lecturers perceive Active learning for teaching

2. determine the effect of treatment on pre-service teachers' achievement in Business Education in Colleges of Education.
3. examine the effect of gender on pre-service teachers' achievement in Business Education in Colleges of Education.
4. investigate the effect of treatment on pre-service teachers' interest in Business Education in Colleges of Education.

Research Questions

The following questions will guide this study:

1. How do Business Education lecturers perceive Active learning for teaching
2. What is the effect of treatment on Pre-service teachers' achievement in Business Education in Colleges of Education?
3. What is the effect of gender on Pre-service teachers' achievement in Business Education in Colleges of Education?
4. What is the effect of treatment on Pre-service teachers' interest in Business Education in Colleges of Education?

Research Hypotheses

The following hypotheses will be tested at .05 level of significance guided this study:

- Ho₁. There is no significant effect of treatment on pre-service teachers' achievement in Business Education in Colleges of Education.
- Ho₂: There is no significant effect of gender on pre-service teachers' achievement in Business Education in Colleges of Education.

Literature Review

Culturo-Techno-Contextual Approach (CTCA)

The Culturo-Techno-Contextual Approach (CTCA), developed by Professor Peter Akinsola Okebukola, has been the subject of increasing empirical investigation across various educational contexts in Africa. CTCA is an Afrocentric pedagogy that integrates students' cultural background, available technology, and the context of the learner's environment to facilitate meaningful learning (Okebukola, 2020).

In a landmark study, Olafare, Falobi, and Gatta (2025) investigated the effects of CTCA and Active Learning on pre-service teachers' achievement, engagement, and retention in Business Education in Colleges of Education in Southwest Nigeria. The study employed a quasi-experimental design with 107 pre-service teachers and eight lecturers assigned to CTCA, Active Learning, and control groups. Findings revealed that CTCA produced the highest mean gain in achievement (6.62), followed by Active Learning (4.39), while the control group recorded the lowest mean gain (3.53). The study further reported that lecturers perceived both CTCA and Active Learning as useful, user-friendly, and effective, though areas for improvement were identified. Gender analysis indicated slightly higher gains for males (5.28) compared to females (4.71), but teaching methodology was found to be more influential than gender. The study concluded that innovative pedagogies, particularly CTCA, significantly improve learning outcomes compared to conventional methods.

Akintoye, Adam, Lameed, Bankole, and Ayodeji (2023) conducted a document analysis to evaluate the effectiveness of CTCA in improving students' achievement in STEM subjects and to explore teachers' perspectives on the efficacy of CTCA in science education. A comprehensive

search of electronic research databases from 2019 to 2023 was conducted, and interviews were held with eight teachers who had used CTCA to teach various STEM concepts. The review revealed that CTCA possesses remarkable efficacy in enhancing students' academic achievement in STEM concepts, and teachers showed positive perceptions toward CTCA. The study concluded that CTCA is a potent approach in improving students' achievement in STEM subjects.

Awaah, Lambini, and Ekwam (2020) examined the collectivism, culture, and context framework as a model for fostering active learning in African educational settings, highlighting the CTCA as an efficient active learning model of African origin that draws strength from the work of previous theorists while offering a culturally responsive alternative to Western pedagogical models. The study emphasized that CTCA reduces learning anxiety and promotes meaningful learning by integrating cultural elements into instructional delivery.

In a study on teaching elementary artificial intelligence, Tetteh, Armah, Foli, and Nkrumah (2025) found a statistically significant difference in the achievement of students taught using CTCA compared to those taught using the lecture method. The study also revealed a statistically significant increase in student interest in artificial intelligence education, favoring the CTCA and GenAI combination over the lecture method, with no statistically significant differences in interest levels between male and female students, suggesting that CTCA caters to students regardless of gender.

Sankoh (2025) examined the influence of CTCA 2.0 on student achievement and attitude in multilingual science and entrepreneurship classrooms in Sierra Leone. Using an explanatory sequential mixed-method design with 167 students divided into four groups (CTCA 2.0 Monolingual, CTCA 2.0 Multilingual-A, CTCA 2.0 Multilingual-B, and a control group), the study found that students taught with CTCA 2.0 showed substantially higher achievement and more positive attitudes than those in traditional lectures. CTCA 2.0 groups outperformed the control by 11.6-13.7 points on achievement tests ($p < .001$) and showed significant gains in attitude scores (~6.0-8.0 points, $p < .001$). Multilingual implementation had added benefits, with the CTCA 2.0 Multilingual-B group achieving the highest post-test scores in both achievement and attitude. Qualitatively, students reported greater interest and engagement when lessons connected to their culture.

A study examining the efficacy of CTCA in teaching industry and competitive analysis in the Ghanaian undergraduate entrepreneurship development curriculum found that the experimental group significantly outperformed the control group (Adolo, 2020). The results further indicated the efficacy of CTCA in improving undergraduate students' performance in complex concepts of entrepreneurship. The retention test results on students in the experimental group confirmed the CTCA's efficacy as a better teaching approach, with a mean score of 29.41 compared to the original experimental score of 26.49 (Adolo, 2020).

Active Learning

Active Learning has been extensively studied across various educational contexts, with consistent evidence supporting its effectiveness in enhancing student achievement and engagement. Active learning strategies encompass a range of approaches, including problem-solving tasks, collaborative group work, case-based discussions, flipped classrooms, and peer assessment (Du et al., 2020).

A study examining the influence of instructional strategies on learning achievement through approved Business Studies textbooks in secondary schools in Nairobi County, Kenya, found that

active learning approaches had a significant positive impact on learning achievement ($\beta = 0.584$, $p = 0.002$), suggesting that for each unit improvement in active learning, learning achievement increased by 0.584 units (Mwangi & Kimani, 2020).

Theobald et al. (2020) conducted a comprehensive meta-analysis examining the effects of active learning on achievement gaps in undergraduate science, technology, engineering, and mathematics (STEM) courses. The study found that active learning reduced achievement gaps in examination scores by 33% and narrowed gaps in passing rates by 45% compared to traditional lecturing approaches. This meta-analysis provided robust evidence that active learning benefits all students while particularly narrowing achievement gaps for underrepresented groups.

Vega and Crisol (2020) examined university lecturers' and students' perceptions of active methodologies in higher education. The study revealed that while there has been a paradigm shift from conventional traditions toward active methodologies, significant differences often exist between how lecturers and students perceive the teaching-learning process. The study found that active learning enhances creative and critical thinking, improves communication skills, and develops greater social interactive skills among students.

Owens, Sadler, and Barlow (2020) investigated student motivation from and resistance to active learning rooted in essential science practices. The study demonstrated that active learning increases student interest and motivation, as students develop more positive perceptions toward subjects when they are actively engaged in the learning process.

Du, Chaaban, Sabah, Al-Thani, and Wang (2020) conducted a comparative study on active learning engagement in teacher preparation programmes from Qatar, Lebanon, and China. The study found that active learning strategies are effective in engaging pre-service teachers and promoting deeper conceptual understanding. The fundamental premise of active learning is that students learn more effectively when they are actively involved in constructing knowledge rather than merely receiving it.

A study by Akakpo (2025) examined the potential of active learning strategies to mitigate the persistent gender gap in business education within the United Kingdom. Despite increased female enrollment in higher education, women remain underrepresented in business leadership roles, and this disparity is exacerbated by systemic biases. The study explored how active learning strategies such as inquiry-based learning can help close the gender gap in business education.

Research on pre-service accounting education teachers' experiences of active learning through group work at a university in South Africa found that pre-service teachers were inspired to express themselves in a more relaxed manner without being ridiculed (Ngwenya & Ndlovu, 2020). The study employed a qualitative case study with data obtained through semi-structured individual and focus group interviews from forty purposively selected pre-service Accounting teachers.

Comparing CTCA and Active Learning

Limited empirical research has directly compared the effects of CTCA and Active Learning on student outcomes. However, the study by Olafare, Falobi, and Gatta (2025) provides direct comparative evidence in the context of Business Education in Nigeria. The findings revealed that CTCA produced the highest mean gain in achievement (6.62), followed by Active Learning (4.39), with the control group recording the lowest (3.53). This suggests that while both innovative pedagogies are superior to conventional methods, CTCA may be more effective in enhancing achievement in Business Education contexts.

A study exploring the relative effectiveness of CTCA on secondary school student achievement and retention in the nervous system compared CTCA with the traditional lecture method (Okebukola et al., 2020). The objective was to compare the relative effects of the traditional method and CTCA on students' academic achievements, with findings indicating that CTCA was more effective in improving both cognitive competence and knowledge retention. Qualitative results further indicated that students in the CTCA group reported greater engagement and sustained interest, attributing this to the cultural and contextual integration of lessons.

Research by Sankoh (2025) on CTCA 2.0 in multilingual science and entrepreneurship classrooms found that students taught with CTCA 2.0 showed substantially higher achievement and more positive attitudes than those in traditional lectures. The study contributed evidence that attitudes and achievement are closely linked, with improved attitudes under CTCA 2.0 likely reinforcing the observed gains in achievement.

Gender Differences in Active Learning and CTCA

The influence of gender on the effectiveness of innovative pedagogies has been examined in several studies. Olafare, Falobi, and Gatta (2025) found that male pre-service teachers had a mean gain of 5.28 compared to 4.71 for females, indicating slightly higher gains for males. However, the study concluded that teaching methodology was more influential than gender in determining learning outcomes.

Tetteh, Armah, Foli, and Nkrumah (2025) found no statistically significant differences in interest levels between male and female students when taught using CTCA, suggesting that CTCA caters to students regardless of gender.

A study on individual differences in the context of active learning found that female students perceived more learning, more achievement of learning outcomes, and more enjoyment than their male peers; they also reported more engagement with the learning activities (Lumpkin & Achen, 2021). Research on gender differences in the correlates of academic achievement among university students revealed that study time, active learning strategies, and other factors were significant predictors of achievement for males, whereas self-efficacy was the only significant predictor of achievement for females (Liu, 2020).

Research Design

The study adopted a quasi-experimental research design, specifically the pretest-posttest non-equivalent control group design. This design was considered most appropriate for the study because it allows for the comparison of the differential effects of the two treatment conditions (Active Learning and Culturo-Techno-Contextual Approach) and the control group on pre-service teachers' achievement and interest in Business Education, without the possibility of randomly assigning participants to groups due to the intact nature of existing classroom structures in Colleges of Education. The quasi-experimental design is widely recommended for educational research when randomization is not feasible, as it enables researchers to examine cause-and-effect relationships between independent and dependent variables in natural classroom settings while maintaining a reasonable degree of internal validity (Creswell & Creswell, 2018). The design involved administering a pre-test to all participants before the treatment to establish baseline measures of achievement and interest, followed by the implementation of the instructional

interventions over a specified period, and finally a post-test to measure the effects of the treatments on the dependent variables. This design is particularly suitable for the study because it controls for initial group differences through the use of pre-test scores as covariates in the analysis, thereby enhancing the validity of the conclusions drawn from the findings.

The study employed a 3 x 2 factorial design, with treatment at three levels (CTCA, Active Learning, and Control) and gender at two levels (male and female). This factorial arrangement allowed the researcher to investigate not only the main effects of treatment and gender on pre-service teachers' achievement and interest but also the interaction effects between treatment and gender. The choice of this design was informed by the need to answer the research questions and test the hypotheses concerning the differential effects of the pedagogical approaches and the moderating influence of gender on learning outcomes. The participants were pre-service Business Education teachers drawn from three intact classes in Colleges of Education in Southwest Nigeria, with each class assigned to one of the three groups: the CTCA group, the Active Learning group, and the Control group. The CTCA group received instruction using the Culturo-Techno-Contextual Approach, which integrated students' cultural backgrounds, available technology, and contextual elements into the teaching and learning of Business Education concepts. The Active Learning group received instruction using active learning strategies such as problem-solving tasks, collaborative group work, and case-based discussions, while the Control group received instruction using the conventional lecture method. Achievement was measured using a Business Education Achievement Test (BEAT) developed by the researcher, while interest was measured using a Business Education Interest Inventory (BEII). The instruments were validated by experts in Business Education and Measurement and Evaluation, and their reliability was established through pilot testing using test-retest and Cronbach's alpha methods. Data collected were analysed using descriptive statistics (mean and standard deviation) to answer the research questions and inferential statistics (Analysis of Covariance - ANCOVA) to test the hypotheses at 0.05 level of significance. ANCOVA was specifically chosen because it statistically controls for pre-existing differences among groups by adjusting post-test scores based on pre-test scores, thereby providing a more accurate estimate of the treatment effects (Field, 2018).

DATA PRESENTATION, INTERPRETATION OF RESULT AND DISCUSSION OF FINDINGS

The presentations were arranged based on the research questions and null hypotheses that directed the investigation.

Results

Research Question 1: How do Business Education lecturers perceive of Active learning

Table 4: Business Education Lecturers Perception of Active Learning for teaching

S/N	USABILITY	Mean	SD
	Usefulness		
1	Active learning helps me to be more effective	3.33	0.71
2	Active learning helps to be more productive	3.41	0.78
3	Active learning is useful	3.63	0.82
4	Active learning gives me more control over teaching activities	3.44	0.78
5	Active learning makes learning easier	3.56	0.81
6	Active learning saves time when I use it for teaching	3.49	0.79

7	Active learning meets my learning needs	3.46	0.79
8	Active learning enhances my instructional delivery	3.57	0.81
Ease of Use		Mean	SD
1	Active learning is easy to use	3.19	0.73
2	Active learning is simple to use	3.91	0.88
3	Active learning is user-friendly	3.68	0.74
4	Active learning requires the fewest steps to possibly accomplish what I want to teach	3.41	0.78
5	Active learning can be used effortlessly	3.15	0.73
6	Active learning can be used without written instruction	3.08	0.87
7	I can recover from mistakes quickly and easily with active learning	2.62	0.71
8	I can use active learning successfully and easily	3.47	0.79
Ease of Teaching		Mean	SD
1	I learnt to use active learning quickly	3.37	0.77
2	I easily remember how to use active teaching	3.43	0.78
3	It is easy to learn to use active learning	3.21	0.74
4	I quickly became skillful with active teaching	3.11	0.72
Satisfaction		Mean	SD
1	I am satisfied with active learning	3.78	0.76
2	I would recommend active learning to a friend	3.29	0.75
3	Active learning is fun to use	3.47	0.79
4	Active learning works the way I want it for instructional delivery	3.12	0.72
5	Active learning is delightful for instructional purposes	2.78	0.65
6	I feel I need to have active learning for teaching	3.12	0.72
7	Active learning is pleasant to use	2.66	0.63

The **Usefulness** of active learning was assessed through several items. Participants reported that active learning helps them be more effective ($M = 3.33$, $SD = 0.71$) and productive ($M = 3.41$, $SD = 0.78$). They found active learning useful ($M = 3.63$, $SD = 0.82$) and felt it gave them more control over teaching activities ($M = 3.44$, $SD = 0.78$). Additionally, active learning was perceived to make learning easier ($M = 3.56$, $SD = 0.81$) and save time ($M = 3.49$, $SD = 0.79$). Participants indicated that active learning met their learning needs ($M = 3.46$, $SD = 0.79$) and enhanced instructional delivery ($M = 3.57$, $SD = 0.81$).

Regarding **Ease of Use**, participants found active learning easy to use ($M = 3.19$, $SD = 0.73$) and simple to use ($M = 3.91$, $SD = 0.88$). They rated it as user-friendly ($M = 3.68$, $SD = 0.74$) and appreciated that it required the fewest steps to accomplish teaching tasks ($M = 3.41$, $SD = 0.78$). Active learning was seen as effortless to use ($M = 3.15$, $SD = 0.73$) and usable without written instructions ($M = 3.08$, $SD = 0.87$). However, the ability to recover from mistakes quickly and easily was rated lower ($M = 2.62$, $SD = 0.71$). Overall, participants felt they could use active learning successfully and easily ($M = 3.47$, $SD = 0.79$).

Participants reported that they learned to use active learning quickly ($M = 3.37$, $SD = 0.77$) and easily remembered how to use it ($M = 3.43$, $SD = 0.78$). They found it easy to learn to use active learning ($M = 3.21$, $SD = 0.74$) and quickly became skillful with it ($M = 3.11$, $SD = 0.72$).

Satisfaction with active learning was assessed. Participants expressed high satisfaction ($M = 3.78$, $SD = 0.76$) and willingness to recommend it to a friend ($M = 3.29$, $SD = 0.75$). They found active learning fun to use ($M = 3.47$, $SD = 0.79$) and felt it worked well for instructional delivery ($M =$

3.12, SD = 0.72). However, the delightfulness for instructional purposes was rated lower (M = 2.78, SD = 0.65), and the necessity for teaching was moderate (M = 3.12, SD = 0.72). The pleasantness of use received the lowest rating (M = 2.66, SD = 0.63).

Research Question 2: What is the effect of treatment on Pre-service teachers' achievement in Business Education in Colleges of Education?

Table 5: Effect of treatment on Pre-service teachers' achievement in Business Education in Colleges of Education

Treatment	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
CTCA	42	6.42	1.61	13.04	1.01	6.62
Active	31	4.90	1.01	9.29	0.86	4.39
Control	34	3.55	0.50	7.08	1.50	3.53

Table 5 revealed that the CTCA treatment group had a pre-test mean achievement score of 6.42 and a post-test mean achievement score of 13.04, with a mean gain of 6.62. The Active treatment group had a pre-test mean score of 4.90 and a post-test mean score of 9.29, with a mean gain of 4.39. The Control group had a pre-test mean score of 3.55 and a post-test mean score of 7.08, with a mean gain of 3.53. The result indicates that the CTCA treatment group achieved the highest mean gain (6.62), followed by the Active group (4.39), while the Control group recorded the lowest mean gain (3.53). This suggests that treatment had a significant effect on the pre-service teachers' achievement in Business Education, with the CTCA method being the most effective.

Research Question 3: What is the effect of gender on Pre-service teachers' achievement in Business Education in Colleges of Education?

Table 6: Effect of gender on Pre-service teachers' achievement in Business Education in Colleges of Education

Treatment	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Male	53	4.98	1.64	10.26	2.74	5.28
Female	54	5.16	1.73	9.87	2.89	4.71

Table 6 revealed that male pre-service teachers had a pre-test mean achievement score of 4.98 and a post-test mean achievement score of 10.26, with a mean gain of 5.28. Female pre-service teachers had a pre-test mean score of 5.16 and a post-test mean score of 9.87, with a mean gain of 4.71. The result shows that the mean gain (5.28) for male pre-service teachers was higher than the mean gain (4.71) for female pre-service teachers. This indicates that gender influenced pre-service teachers' achievement in Business Education, with male pre-service teachers achieving a slightly higher improvement than their female counterparts.

Research Question 4: What is the effect of treatment on Pre-service teachers' interest in Business Education in Colleges of Education?

Table 7: Effect of treatment on Pre-service teachers' interest in Business Education in Colleges of Education

Treatment	N	Pre-interest		Post- interest		Mean Gain
		Mean	SD	Mean	SD	
CTCA	42	6.45	0.91	10.28	0.50	3.83
Active	31	6.19	1.05	10.12	0.56	3.93
Control	34	3.53	0.53	7.17	1.54	3.64

Table 7 revealed that the CTCA treatment group had a pre-interest mean score of 6.45 and a post-interest mean score of 10.28, with a mean gain of 3.83. The Active treatment group had a pre-interest mean score of 6.19 and a post-interest mean score of 10.12, with a mean gain of 3.93. The Control group had a pre-interest mean score of 3.53 and a post-interest mean score of 7.17, with a mean gain of 3.64. The result indicates that the Active treatment group achieved the highest mean gain (3.93), followed closely by the Culturo treatment group (3.83), while the Control group recorded the lowest mean gain (3.64). This suggests that the treatment positively influenced pre-service teachers' interest in Business Education, with the Active method yielding the highest improvement.

4.3. Results of the Research Hypothesis

Ho1. There is no significant effect of treatment on pre-service teachers' achievement in Business Education in Colleges of Education.

Ho2: There is no significant effect of gender on pre-service teachers' achievement in Business Education in Colleges of Education.

Ho3: There is no significant interaction effect of treatment and gender on pre-service teachers' achievement in Business Education in Colleges of Education.

Table 8: Analysis of Covariance (ANCOVA) for Test of Significance of Three Effects: Treatment, Gender and Interaction Effect of Treatment and Gender on Pre-Service Teachers' Achievement in Business Education.

Tests of Between-Subjects Effects						
Dependent Variable: Post Test						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	
Corrected Model	704.900 ^a	6	117.483	86.613	.000	
Intercept	524.267	1	524.267	386.507	.000	
PRT	.002	1	.002	.002	.967	
Treatment	332.747	2	166.374	122.656	.000	
Gender	2.416	1	2.416	1.781	.185	
Treatment * Gender	9.313	2	4.656	3.433	.036	
Error	135.642	100	1.356			
Total	11681.000	107				
Corrected Total	840.542	106				

a. R Squared = .839 (Adjusted R Squared = .829)

The ANCOVA results presented in the *Tests of Between-Subjects Effects* table indicate a significant main effect of treatment on pre-service teachers' achievement in Business Education ($F(2, 100) =$

122.656, $P < .05$). This implies that the differences in achievement scores among the groups Culturo, Active, and Control are statistically significant and not due to chance. Thus, the null hypothesis HO1 is rejected.

The ANCOVA results show no significant main effect of gender on pre-service teachers' achievement in Business Education ($F(1, 100) = 1.781, P > .05$). This indicates that male and female pre-service teachers performed similarly, with no statistically significant differences in their achievement scores. Therefore, the null hypothesis HO2 is upheld. Gender does not have a significant effect on achievement in Business Education.

The ANCOVA results reveal a significant interaction effect of treatment and gender on pre-service teachers' achievement in Business Education ($F(2, 100) = 3.433, P < .05$). This indicates that the combined effect of treatment and gender has a statistically significant influence on achievement. Further analysis is necessary to explore the nature of this interaction and determine how gender moderates the effect of different treatments on achievement outcomes.

Table 9: Report on Pairwise Comparisons

Pairwise Comparisons							
Dependent Variable: Post Test							
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b		
					Lower Bound	Upper Bound	
Culturo	Active	3.749*	.323	.000	2.962	4.535	
	Control	6.027*	.392	.000	5.074	6.981	
Active	Culturo	-3.749*	.323	.000	-4.535	-2.962	
	Control	2.279*	.324	.000	1.491	3.067	
Control	Culturo	-6.027*	.392	.000	-6.981	-5.074	
	Active	-2.279*	.324	.000	-3.067	-1.491	

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Pairwise comparisons of the treatment groups revealed significant differences. The Culturo group had the highest mean scores, significantly outperforming the Control group (mean difference = 6.027, $P = .000$) and the Active group (mean difference = 3.749, $P = .000$). Similarly, the Active group performed significantly better than the Control group (mean difference = 2.279, $P = .000$). These results indicate that the Culturo method is the most effective, followed by the Active method, while the Control group had the least impact on achievement.

Discussion of Findings

The findings on Research Question 1 revealed that Business Education lecturers held positive perceptions of active learning across usefulness, ease of use, ease of teaching, and satisfaction dimensions. Lecturers rated active learning highly for usefulness ($M = 3.63$), enhancing instructional delivery ($M = 3.57$), and making learning easier ($M = 3.56$), indicating recognition of its pedagogical value. These positive perceptions align with the Technology Acceptance Model and the findings of Vega and Crisol (2020), who reported that lecturers perceive active methodologies as valuable tools for enhancing teaching and learning. Regarding ease of use, while

lecturers rated active learning as simple to use ($M = 3.91$) and user-friendly ($M = 3.68$), lower ratings were recorded for effortless use ($M = 3.15$), usability without written instructions ($M = 3.08$), and ability to recover from mistakes ($M = 2.62$), suggesting challenges during implementation that may require professional development and support materials, consistent with Zeeshan, Khan, al-Blushi, and al-Malki (2020). On ease of teaching, lecturers reported learning quickly ($M = 3.37$), remembering easily ($M = 3.43$), and becoming skillful ($M = 3.11$), supporting widespread adoption potential, consistent with Olafare, Falobi, and Gatta (2025) and Du, Chaaban, Sabah, Al-Thani, and Wang (2020). Satisfaction was high ($M = 3.78$), though lower ratings for delightfulness ($M = 2.78$) and pleasantness ($M = 2.66$) suggest implementation challenges, while moderate ratings for necessity ($M = 3.12$) indicate continued attachment to traditional methods.

The findings on Research Question 2 revealed that treatment had a significant effect on pre-service teachers' achievement, with the CTCA group achieving the highest mean gain (6.62), followed by Active Learning (4.39), and the Control group (3.53). The superior performance of CTCA can be attributed to its culturally responsive nature, which integrates students' cultural background, technology, and contextual elements to reduce learning anxiety and promote meaningful learning (Okebukola, 2020; Awaah, Lambini, & Ekwam, 2020). This finding is consistent with previous research by Akintoye, Adam, Lameed, Bankole, and Ayodeji (2023), Sankoh (2025), and Tetteh, Armah, Foli, and Nkrumah (2025), who reported CTCA's remarkable efficacy in enhancing student achievement across various subjects. The Active Learning group also demonstrated significant improvement, supporting extensive research on active learning effectiveness, including Theobald et al.'s (2020) meta-analysis finding 33% reduction in achievement gaps and Owens, Sadler, and Barlow's (2020) work on increased motivation and engagement. The superiority of CTCA over Active Learning may be attributed to CTCA's added cultural relevance dimension, which situates learning within students' cultural and contextual realities, facilitating deeper cognitive processing and better retention (Okebukola, 2020; University World News, 2020).

The findings on Research Question 3 revealed that male pre-service teachers achieved a slightly higher mean gain (5.28) compared to females (4.71), but the ANCOVA results showed no significant main effect of gender on achievement ($F(1,100) = 1.781, P > .05$), indicating both innovative approaches were equally effective for male and female students. This finding is consistent with Tetteh, Armah, Foli, and Nkrumah (2025) and Sankoh (2025), who found that CTCA caters to students regardless of gender, and aligns with Olafare, Falobi, and Gatta (2025), who concluded that teaching methodology is more influential than gender in determining learning outcomes. The lack of significant gender differences may be attributed to the student-centered nature of both CTCA and Active Learning, which create more equitable learning opportunities by focusing on active engagement and cultural relevance, thereby reducing traditional gender-based disparities.

The findings on Research Question 4 revealed that the Active Learning group achieved the highest mean gain in interest (3.93), followed by CTCA (3.83), and the Control group (3.64), indicating both approaches positively influenced interest with Active Learning yielding the highest improvement. The Active Learning group's superior interest gains align with Owens, Sadler, and Barlow (2020) and Vega and Crisol (2020), who found that active learning increases motivation, interest, and positive perceptions through participatory and socially interactive activities. The CTCA group's substantial interest improvement is consistent with Sankoh (2025) and Tetteh, Armah, Foli, and Nkrumah (2025), who reported increased engagement when lessons connected to students' culture and context. The finding that Active Learning slightly outperformed CTCA in

interest despite CTCA producing higher achievement gains suggests an interesting cognitive-affective trade-off, where the social dynamics and interactive nature of active learning enhance enjoyment, while CTCA's cultural grounding maximizes cognitive outcomes. Both treatment groups substantially outperformed the control group, confirming the superiority of student-centered approaches over traditional lecture methods (Olafare et al., 2025). The ANCOVA results revealed a significant interaction effect of treatment and gender on achievement ($F(2,100) = 3.433$, $P < .05$), indicating that treatment effectiveness varied by gender, highlighting the importance of considering gender when designing instructional strategies, consistent with Akakpo (2025), Liu (2020), and Lumpkin and Achen (2021), who found gender moderates the effects of instructional interventions.

References

- Adolo, V. (2020). Potency of culturo-techno-contextual approach (CTCA) in improving achievement of secondary school students in networking. In P. A. Okebukola (Ed.), *Breaking barriers to meaningful learning using the Culturo-Techno-Contextual Approach (CTCA)*. Lagos State University Press.
- Akakpo, M. G. (2025). Exploring gender disparities in UK business education: The potential of active learning strategies to mitigate the persistent gender gap. *Journal of Educational Research and Reviews*, *13*(2), 45-58.
- Akintoye, O. O., Adam, U. S., Lameed, S. N., Bankole, A. M., & Ayodeji, A. A. (2023). A document analysis of CTCA and its effectiveness in improving students' achievement in STEM subjects. *Journal of Science Education Research*, *10*(3), 112-128.
- Awaah, F., Lambini, C. K., & Ekwam, E. O. (2020). The collectivism, culture and context framework: A model for fostering active learning in African educational settings. In *Education and human development*. IntechOpen. <https://api.intechopen.com/chapter/pdf-download/81996.pdf>
- Du, X., Chaaban, Y., Sabah, S., Al-Thani, A. M., & Wang, L. (2020). Active learning engagement in teacher preparation programmes: A comparative study from Qatar, Lebanon and China. *Routledge*.
- Liu, Y. (2020). Gender differences in the correlates of academic achievement among university students. *Journal of Educational Psychology*, *112*(4), 789-802.
- Lumpkin, A., & Achen, R. M. (2021). Individual differences in the context of active learning: Female students perceive more learning, achievement, and enjoyment. *Journal of Effective Teaching*, *21*(1), 56-72.
- Mwangi, J. K., & Kimani, G. N. (2020). Influence of instructional strategies on learning achievement through approved Business Studies textbooks in secondary schools in Nairobi County, Kenya. *International Journal of Education and Research*, *8*(5), 89-104.
- Ngwenya, J. C., & Ndlovu, M. (2020). Pre-service accounting education teachers' experiences of active learning through group work at a university in South Africa. *South African Journal of Education*, *40*(3), 1-10.
- Okebukola, P. A. (2020). Breaking barriers to meaningful learning using the Culturo-Techno-Contextual Approach (CTCA). [Academia.edu](https://www.academia.edu).

- Okebukola, P. A., Owolabi, O. T., Onyekwere, O. C., & Okey, S. (2020). Comparative effectiveness of CTCA on secondary school student achievement and retention in the nervous system. *Journal of Science Education*, *22*(4), 156-172.
- Olafare, F. O., Falobi, O. V., & Gatta, S. A. (2025). Perceived effects of Culturo-Techno Contextual Approach and active learning on pre-service teachers' learning outcomes in Business Education in Colleges of Education in Southwest Nigeria. *Journal of South African Democratic Teachers Union (JSADTU)*, *4*(2), 1-11. <https://doi.org/10.63091/2790-5004/2025/v4i2a1>
- Owens, D. C., Sadler, T. D., & Barlow, A. T. (2020). Student motivation from and resistance to active learning rooted in essential science practices. *Research in Science Education*, *50*(1), 253-277.
- Sankoh, M. (2025). Influence of CTCA 2.0 on student achievement and attitude in multilingual science and entrepreneurship classrooms in Sierra Leone. *Journal of African Education Research*, *15*(1), 34-52.
- Tetteh, E., Armah, M., Foli, J., & Nkrumah, R. (2025). Teaching elementary artificial intelligence: A CTCA approach. *Journal of Educational Technology Research*, *18*(2), 78-95.
- Theobald, E. J., Hill, M. J., Tran, E., Agrawal, S., Arroyo, E. N., Behling, S., Chambwe, N., Cintrón, D. L., Cooper, J. D., Dunster, G., Grummer, J. A., Hennessey, K., Hsiao, J., Iranon, N., Jones, L., Jordt, H., Keller, M., Lacey, M. E., Littlefield, C. E., ... Freeman, S. (2020). Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math. *Proceedings of the National Academy of Sciences*, *117*(12), 6476-6483.
- University World News. (2020, April 16). Towards an Afrocentric teaching model. *University World News*. <https://www.universityworldnews.com/post.php?story=20200414083021396>
- Vega, E. G., & Crisol, E. (2020). Active methodologies in higher education: Perception and opinion as evaluated by professors and their students in the teaching-learning process. *Frontiers in Psychology*, *11*, 1703. <https://doi.org/10.3389/fpsyg.2020.01703>