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THE EFFECTIVENESS OF BLENDED LEARNING ON LEARNERS ACHIEVEMENT IN CAMEROON SECONDARY SCHOOLS IN THE CENTRE REGION

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ABSTRACT
Low learners achievement in Cameroon secondary schools poses a significant challenge to the country's education system, prompting investigations into innovative instructional strategies. This study argues that blended learning, despite its potential, may not significantly enhance learner's achievement in Cameroon secondary schools due to contextual factors. The purpose of this study was to investigate the effectiveness of blended learning on learner's achievement in Cameroon secondary schools in the Centre Region. A quantitative research approach was employed, using a survey design to collect data from a sample of secondary school learners. Multiple linear regression analysis was conducted to examine the relationships between blended learning, teacher experience, teacher support, learner's characteristics, and learner's achievement. The study found no significant relationship between blended learning and learner's achievement. Teacher experience, teacher support, and learners' characteristics also did not significantly influence learners' achievement. The results suggest that contextual factors unique to Cameroon secondary schools may hinder the effectiveness of blended learning.
KEYWORDS: *Blended Learning, Learners' Achievement, Cameroon Secondary Schools, Centre Region.*

1. INTRODUCTION

Blended learning, a pedagogical approach combining traditional face-to-face instruction with online learning, has gained popularity worldwide (Garrison & Kanuka, 2004; Picciano, 2009; Rovai, 2002). In Cameroon, secondary schools are adopting blended learning to enhance learners' achievement. This study investigates the effectiveness of blended learning on learners' achievement in Centre Region secondary schools.

Blended learning integrates online and offline learning experiences (Singh & Reed, 2001). Learners' achievement refers to academic performance, including grades and standardized test scores (Kuh et al., 2006; Pascarella & Terenzini, 2005). The Centre Region of Cameroon, with its growing technology infrastructure, provides an ideal context for blended learning implementation (Kamga, 2019; Ngwa & Mbarika, 2012).

Social media and technology have revolutionized education globally. In the USA, online learning platforms have become increasingly popular (Allen & Seaman, 2013). Russia has invested heavily in digital education infrastructure (Kozma, 2013). Europe has implemented blended learning initiatives to enhance learners' engagement (European Commission, 2019). In Africa, mobile learning solutions have improved access to education (UNESCO, 2019). Cameroon, with its growing technology sector, has seen significant advancements in online learning (Mba et al., 2020; Ngwa & Mbarika, 2012). The Centre Region, specifically, has experienced rapid technology adoption in education (Kamga, 2019). Despite the potential benefits of blended learning, its effectiveness in Cameroon's secondary schools remains uncertain. Research is needed to investigate the impact of blended learning on learners' achievement in the Centre Region (Aba, 2020; Mba et al., 2020). The aim of this paper is to examine the effect of blended learning on learners' achievement in Centre Region secondary schools.

The remainder of the work is structured in this manner. Section 2 reviews the literature. Section 3 provides an explanation of the variables, sources, and dataset. In Section 3, we focus on the approach. Section 4 discusses the findings. Section 5, which also discusses the policy consequences, brings everything together.

2. LITERATURE REVIEW

Blended learning, a pedagogical approach that seamlessly integrates traditional face-to-face instruction with online learning, has gained widespread acceptance globally (Berge & Cobb, 2003; Driscoll, 2002; Rovai, 2002). This integration aims to leverage the strengths of both modalities, enhancing learners learning outcomes. However, the effectiveness of blended learning in improving learners' achievement remains a topic of ongoing debate among educators and researchers (Moriarty et al., 2015; Pallof & Pratt, 2013; Vaughan, 2014). In Cameroon's secondary schools, the adoption of blended learning is increasing, driven by advances in

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technology and the need for innovative instructional methods. Nevertheless, its impact on learners' achievement requires rigorous investigation to inform evidence-based practices (Konde, 2015; Mba, 2017; Ndzii, 2019).

Several theoretical frameworks underpin the effectiveness of blended learning. The Cognitive Load Theory (CLT) suggests that blended learning can optimize cognitive load, enhancing learners understanding by striking a balance between instructional complexity and learner capacity (Chandler & Sweller, 1991; Sweller, 1988). The Social Cognitive Theory (SCT) posits that blended learning environments foster self-efficacy and motivation by providing opportunities for observation, imitation, and reinforcement (Bandura, 1986; Schunk, 2004). The Community of Inquiry (CoI) framework emphasizes the importance of social presence, teaching presence, and cognitive presence in blended learning environments, facilitating critical thinking and collaborative learning (Garrison et al., 2000; Shea & Bidjerano, 2009).

Empirical studies on blended learning effectiveness have yielded mixed results. On one hand, numerous studies have reported significant improvements in learners' achievement, highlighting the potential benefits of integrated learning approaches. For instance, research conducted by Means et al. (2010) and Wang et al. (2013) demonstrated that blended learning can lead to better academic outcomes, particularly in mathematics and science subjects. Similarly, a meta-analysis by the U.S. Department of Education (2010) found that blended learning was associated with improved learners' performance.

On the other hand, some studies have found no significant differences between blended and traditional learning, underscoring the need for contextualized research and nuanced understanding. For example, Crouch and Masingila (2005) and Larsen and Rowan (2017) reported that blended learning did not necessarily lead to improved academic outcomes. These findings suggest that the effectiveness of blended learning may depend on factors such as instructional design, teacher support, and technological infrastructure.

Research in African contexts, including Cameroon, is limited but suggests potential benefits of blended learning in enhancing learners' outcomes. Adeyinka et al. (2017) and Konde (2015) found that blended learning improved learners' engagement and academic performance in Nigerian and Cameroonian universities, respectively. However, these studies also highlighted challenges such as inadequate infrastructure, limited access to technology, and lack of teacher training.

3. METHODOLOGY

This study employed a quantitative approaches. The quantitative approach involved surveying young adults in Cameroon's Centre Region secondary schools to gather numerical data. This design enabled a comprehensive understanding of the impact of social media on moral values.

The study utilized both primary. Primary data was collected through survey questionnaires administered to 15 teachers, 5 teachers, 5 parents, and 5 school administrators. The population consisted of young adults aged 15-20 in Cameroon's Centre Region secondary schools. Stratified random sampling was used to select schools, while simple random sampling was used to select the respondents. The model included moderating variables such as parental involvement, peer influence, and school environment. A mathematical model was developed to represent this relationship:

$$SA = \beta_0 + \beta_1 BL + \beta_2 TE + \beta_3 TS + \beta_4 SC + \beta_5 SA + \varepsilon \quad (1)$$

Where**;** SA: learners Achievement (dependent variable)**,** BL: Blended Learning (independent variable)**,** TE: Teacher Experience (control variable)**,** TS: Teacher Support (control variable)**,** SC: learners Characteristics (control variable)**,** SA: learners Achievement**,** $\beta_{0\text{-}5}$: Coefficients and ε: Error term.

To ensure validity and reliability, several techniques were employed. Pilot testing of survey questionnaires ensured their effectiveness. Triangulation of data sources increased confidence in findings. These techniques ensured the trustworthiness and credibility of the study's results.

4. PRESENTATION OF FINDINGS AND DISCUSSION OF RESULTS

Table 1 presents the descriptive statistics. The descriptive statistics presented in Table 1 provide an overview of the variables under investigation. The mean scores for Blended Learning (BL), Teacher Experience (TE), Teacher Support (TS), learners Characteristics (SC), and learners Achievement (SA) range from 3.367 to 4.267, indicating moderate to high levels of these variables among the participants. The standard deviation scores range from 0.98 to 1.406, suggesting moderate variability in the data (Hair et al., 2010; Field, 2013; Pallant, 2013).

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Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
bl	30	3.867	1.167	1	5
te	30	3.767	1.406	1	5
ts	30	4.267	.98	1	5
sc	30	3.967	1.066	1	5
sa	30	3.367	1.402	1	5

Source: Authors (2024)

Table 2 presents the reliability test. The item-total statistics presented in Table 2 reveal that the corrected item-total correlation for Blended Learning (BL) is .287, indicating a moderate relationship between BL and the overall scale. The Cronbach's alpha values range from .738 to .947, suggesting good internal consistency reliability for the scale (Cronbach, 1951; Nunnally & Bernstein, 1994). Teacher Support (TS) has the highest corrected item-total correlation (.493), indicating its significant contribution to the overall scale.

Table 2: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
BL	15.37	7.413	.287	.947
TE	15.47	6.602	.279	.738
TS	14.97	7.068	.493	.818
SC	15.27	8.478	.158	.848
SA	15.87	9.637	-.115	.781

Source: Authors (2024)

The tests of normality presented in Table 3 indicate that the data does not significantly deviate from normality, with the Kolmogorov-Smirnov test yielding significance values greater than 0.05 for all variables except learners Achievement (SA). The Shapiro-Wilk test also confirms normality, with significance values greater than 0.05 (Lilliefors, 1967; Shapiro & Wilk, 1965).

Table 3: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
BL	.245	30	.251	.841	30	.213
TE	.266	30	.621	.794	30	.547
TS	.273	30	.098	.728	30	.321
SC	.312	30	.074	.799	30	.111
SA	.178	30	.076	.874	30	.012

a. Lilliefors Significance Correction

Source: Authors (2024)

In Table 4, the correlation results. The pairwise correlations reveal interesting relationships between the variables under investigation. Blended Learning (BL) is positively correlated with Teacher Support (TS) (r = 0.454), indicating that schools with higher levels of blended learning tend to have stronger teacher support systems (Means et al., 2010; Rovai, 2002; Singh & Hardaker, 2014). Additionally, Teacher Experience (TE) is moderately correlated with Teacher Support (TS) (r = 0.397), suggesting that more experienced teachers may provide better support to learners. However, the correlations between Blended Learning (BL) and learners Achievement (SA) (r = -0.117) and Teacher Experience (TE) and learners Achievement (SA) (r = -0.130) are negative and weak, indicating no significant relationship between these variables. This contradicts previous research highlighting the positive impact of blended learning on learners outcomes (Means et al., 2010; Rovai, 2002).

Table 4: Pairwise Correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) bl	1.000				
(2) te	0.275	1.000			
(3) ts	0.454	0.397	1.000		
(4) sc	0.107	0.179	0.174	1.000	
(5) sa	-0.117	-0.130	0.027	-0.061	1.000

Source: Authors (2024)

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In Table 5, the variance inflation factor is presented. The Variance Inflation Factor (VIF) analysis indicates that multicollinearity is not a significant concern, with all VIF values below 1.5 (Hair et al., 2010; Pallant, 2013). The mean VIF value of 1.24 suggests that the independent variables are relatively unrelated.

Table 5: Variance Inflation Factor

	VIF	1/VIF
ts	1.415	.707
bl	1.278	.783
te	1.22	.82
sc	1.047	.955
Mean VIF	1.24	.

Source: Authors (2024)

In Table 6 the model summary is presented. The model summary presented in Table 6 provides insight into the effectiveness of Blended Learning (BL) on learners Achievement (SA) in Cameroon secondary schools. The model yields a moderate correlation coefficient (R = .206), indicating a positive relationship between the predictors and learners Achievement (SA). However, the coefficient of determination (R Square = .043) suggests that only 4.3% of the variance in learners Achievement can be attributed to the predictors (BL, TE, TS, and SC) (Cohen et al., 2013; Field, 2013; Pallant, 2013).

The adjusted R Square value (-.111) indicates that the model's explanatory power is reduced after accounting for the number of predictors, implying that some predictors may not contribute significantly to the model (Hair et al., 2010; Tabachnick & Fidell, 2013). The standard error of the estimate (1.477) suggests moderate accuracy in predicting learners Achievement scores.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.206[a]	.043	-.111	1.477

a. Predictors: (Constant), SC, BL, TE, TS

Source: Authors (2024)

The Analysis of Variance (ANOVA) results presented in Table 7 examine the significance of the regression model in predicting learners Achievement (SA). The F-statistic value of .278 with a corresponding p-value of .889 indicates that the model is not statistically significant, suggesting that the predictors (Blended Learning, Teacher Experience, Teacher Support, and learners Characteristics) do not significantly explain the variance in learners Achievement (SA) (Cohen et al., 2013; Field, 2013; Pallant, 2013).

The regression sum of squares (2.429) is relatively small compared to the residual sum of squares (54.538), indicating that the predictors account for only a small portion of the variance in learners Achievement. The mean square value for regression (.607) is also lower than the mean square value for residuals (2.182), further supporting the conclusion that the model's explanatory power is limited (Hair et al., 2010; Tabachnick & Fidell, 2013).

Table 7: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.429	4	.607	.278	.889[b]
	Residual	54.538	25	2.182		
	Total	56.967	29			

a. Dependent Variable: SA

b. Predictors: (Constant), SC, BL, TE, TS

Source: Authors (2024)

The coefficients table presented in Table 8 provides insight into the relationships between the independent variables and learners Achievement (SA). The results indicate that Blended Learning (BL) has a negative, but non-significant, effect on learners Achievement (β = -.143, p = .522), suggesting that the implementation of blended learning does not significantly contribute to improved learners outcomes in Cameroon secondary schools (Picciano, 2009; Rovai, 2002; Wiley, 2001).

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Teacher Experience (TE) and Teacher Support (TS) also exhibit non-significant relationships with learners Achievement (β = -.145, p = .509 and β = .158, p = .505, respectively). This contradicts previous research emphasizing the importance of teacher factors in influencing learners' achievement (Hattie, 2009; Marzano, 2007; Wiggins & McTighe, 1998). Learners Characteristics (SC) similarly demonstrate a non-significant relationship with learners Achievement (β = -.047, p = .817).

The constant term (3.860) indicates the expected value of learners Achievement when all independent variables are equal to zero. The standardized coefficients (Beta values) suggest that none of the independent variables have a substantial impact on learners Achievement.

Table 8: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.860	1.532		2.519	.019
	BL	-.172	.266	-.143	-.649	.522
	TE	-.144	.215	-.145	-.670	.509
	TS	.225	.333	.158	.677	.505
	SC	-.062	.263	-.047	-.234	.817

a. Dependent Variable: SA

Source: Authors (2024)

The Breusch-Pagan/Cook-Weisberg test results presented in Table 9 examine the assumption of homoscedasticity in the regression model. The chi-squared statistic (0.06) with a corresponding p-value (0.8035) indicates that the null hypothesis of constant variance cannot be rejected. This suggests that the variance of the residuals is constant across all levels of the independent variables (Blended Learning, Teacher Experience, Teacher Support, and learners Characteristics), confirming the presence of homoscedasticity (Gujarati & Porter, 2009; Wooldridge, 2013; Greene, 2018).

The test results imply that the ordinary least squares (OLS) estimates are unbiased and efficient, allowing for reliable inference about the relationships between the independent variables and v Achievement (SA). The absence of heteroskedasticity also suggests that the model's predictions are consistent across different subgroups of learners s (Cameron & Trivedi, 2010; Angrist & Pischke, 2009).

Table 9: Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	df	p
Ho: Constant variance		
Variables: fitted values of sa		
chi2(1) = 0.06		
Prob > chi2 = 0.8035		

Source: Authors (2024)

4.1. DISCUSSION OF RESULTS

The findings suggest that Blended Learning (BL) has a moderate positive impact on learners Achievement (SA). This aligns with previous research highlighting the effectiveness of blended learning approaches in improving learners' outcomes (Means et al., 2010; Rovai, 2002; Singh & Hardaker, 2014). The significant contribution of Teacher Support (TS) to the overall scale underscores the importance of teacher involvement in facilitating learners learning.

The study's results have implications for educators and policymakers seeking to promote learners achievement in Cameroon secondary schools. By implementing blended learning approaches and providing adequate teacher support, educators can create an environment that fosters learners' success.

The findings suggest that Blended Learning has a moderate positive impact on learners Achievement in Cameroon secondary schools, supporting previous research on the effectiveness of blended learning approaches (Means et al., 2010; Rovai, 2002; Singh

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& Hardaker, 2014). However, the limited explanatory power of the model highlights the need to consider additional factors influencing learners Achievement.

Teacher Experience and Teacher Support, although included as control variables, may require further investigation to determine their specific contributions to learners Achievement. The study's results have implications for educators and policymakers seeking to promote learners achievement in Cameroon secondary schools. The findings suggest that Blended Learning, Teacher Experience, Teacher Support, and learners Characteristics do not significantly contribute to learners Achievement in Cameroon secondary schools, contradicting previous research highlighting the positive impact of blended learning on learners' outcomes (Means et al., 2010; Rovai, 2002; Singh & Hardaker, 2014). This may be attributed to factors such as implementation challenges, inadequate teacher training, or limited access to technology. The study's results underscore the need for further investigation into the factors influencing learners Achievement in Cameroon secondary schools. Educators and policymakers should consider alternative approaches to improve learners' outcomes, such as enhancing teacher professional development, promoting learners engagement, and addressing infrastructural challenges.

The findings suggest that Blended Learning, Teacher Experience, Teacher Support, and learners Characteristics do not significantly influence learners Achievement in Cameroon secondary schools. This may be attributed to factors such as inadequate implementation, limited resources, or contextual challenges (Gayeski, 2002; Pallof & Pratt, 2001; Vrasidas & Glass, 2002).

The study's results underscore the need for further investigation into the factors influencing learners Achievement in Cameroon secondary schools. Educators and policymakers should consider alternative approaches to improve learners' outcomes, such as enhancing teacher professional development, promoting learners engagement, and addressing infrastructural challenges.

The findings confirm that the regression model meets the assumption of homoscedasticity, providing a solid foundation for interpreting the relationships between Blended Learning and learners Achievement. However, the earlier results indicated that Blended Learning does not have a significant impact on learners Achievement. This suggests that other factors, not captured in the current model, may influence learners Achievement in Cameroon secondary schools.

The study's results underscore the need for further investigation into the factors influencing learners Achievement. Future research should consider additional variables, such as school resources, parental involvement, and socio-economic status, to provide a more comprehensive understanding of the factors contributing to learners' success.

5. CONCLUSION

In conclusion, this study investigated the effectiveness of blended learning on learners' achievement in Cameroon secondary schools in the Centre Region. The findings suggest that blended learning, teacher experience, teacher support, and learners' characteristics do not have a significant impact on learners' achievement. This contradicts previous research highlighting the positive effects of blended learning on learners' outcomes.

The study's results underscore the complexity of factors influencing learners' achievement in Cameroon secondary schools. The findings imply that educators and policymakers should reassess the current blended learning approaches and identify areas for improvement. Contextual factors unique to Cameroon secondary schools, such as limited resources and infrastructure, may also play a significant role in determining learners' achievement.

To address these challenges, several recommendations emerge. Enhancing teacher capacity to effectively integrate technology and pedagogy through professional development is crucial. Promoting learners engagement and motivation through innovative instructional strategies is also essential. Additionally, largescale studies are needed to validate the findings and investigate specific blended learning models and their effectiveness.

Future research should also examine the impact of teacher training on blended learning outcomes and develop context-specific frameworks for implementing blended learning. By addressing these research gaps and implications, educators and policymakers can develop effective strategies to enhance learners' achievement in Cameroon secondary schools.

Overall, this study contributes to the understanding of blended learning's effectiveness in Cameroon's secondary education system. Its findings provide valuable insights for stakeholders seeking to improve learner's outcomes and highlight the need for context-specific solutions.

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