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Effect of Mobile Learning Utilization on Academic Performance of Postgraduate Education Students in Public Universities in Rivers State

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ABSTRACT
This study investigated effect of mobile learning on the academic performance of postgraduate Education students in public universities in Rivers State. Three research questions and three null hypotheses guided the study. The study adopted quasi-experimental design with a population of 700 postgraduate education students of ICT in 2025/2026 academic session. Purposive sampling technique was adopted to sample Rivers State University for the study, census sampling was used to sample all Postgraduate Education students of 2025/2026 session for the study. The 300 postgraduate Education students of Rivers State University were divided into experimental and control group, each of the groups have 150 students. Pretest was given to the two groups first, before treatment. The experimental group were exposed to blended learning, collaborative learning and social learning via mobile learning while the control group was taught using lecture method. The post test was also introduced after the treatment. Data were collected using Information Technology Achievement Test (ITAT). Mean and standard deviation were used to answer the research questions and independent samples t-test to test the hypotheses at 0.05 level of significance. The findings revealed that Blended learning, collaborative learning and mobile learning strategies significantly improved students' academic achievement over the traditional lecture method. Thus, the authors recommend the integration of mobile learning into postgraduate instruction, regular training of lecturers, improved digital infrastructure in schools, and supportive institutional policies.
Keywords: Academic-Performance, Blended-Learning, Collaborative-Learning, Mobile-Learning, Social-Learning,

INTRODUCTION

Education has long been structured around the physical classroom, where teaching occurs through direct face-to-face interaction, with the teacher as the primary source of knowledge and students in a more passive role. Traditional education emphasizes teacher-centred and rote learning methods (Pooja, 2024). However, contemporary perspectives have shifted toward interactive and learner-centred learning. According to Illeris (2018), learning involves cognitive, emotional and social dimensions and is shaped by experience, motivation, and context, creating the need for learning environments that support this process.

The contemporary university learning environment has been transformed by digital technologies, with students increasingly using smartphones and portable devices to access academic content, submit assignments, and interact with peers and instructors. According to Bates (2019), technology enables more

flexible, scalable, and learner-centred teaching and learning. However, challenges such as digital literacy gaps, unequal access to devices, and varying technological competence remain important considerations. Technology integration refers to the effective incorporation of digital tools into teaching and learning to enhance educational outcomes. It is not merely the presence of technology but how it supports meaningful learning experiences. The TPACK framework emphasizes that effective technology-based teaching requires the interaction of technology, pedagogy, and subject content (Koehler & Mishra, 2009). Intentional integration can improve access, engagement, and understanding and has contributed to flexible forms of digital learning. It is on this background that the demand for the engagement of Educational Technology expert arise (Mbaba, et al., 2024).

Mobile technologies, particularly smartphones and tablets, are practical learning tools because of their portability, affordability, and availability. Technology integration improves teaching and learning productivity, develops 21st-century skills, and increases students' motivation (Wordu & Ogolo, 2020). In developing contexts where large-scale technological infrastructure may be limited, mobile technologies provide a realistic alternative for supporting learning. This growing relevance provides the basis for understanding mobile learning. Mobile learning, or m-learning, is a subset of e-learning that uses smartphones, tablets, and other portable digital tools to facilitate learning anytime and anywhere. It shifts learning from fixed locations to a more flexible and learner-driven approach (Kukulska-Hulme, 2012). Mobile learning enables learners to engage with educational content across different environments, supporting continuous, self-directed, and personalized learning (Mike et al., 2007). It also shifts control from institutions to learners, fostering independence and self-regulation, particularly in higher education.

Mobile learning represents a paradigm shift toward flexible, learner-centred, and context-independent education. Smartphones, mobile applications, cloud computing, wireless networks, and high-speed internet have strengthened its capacity to support flexibility, accessibility, collaboration, and personalized learning (Tang & Hew, 2022). However, infrastructural limitations, particularly in developing countries, can constrain effective implementation (World Bank, 2022). Therefore, its benefits must be considered alongside the accessibility and contextual conditions that influence its utilization. The adoption of mobile learning in developing countries has been driven by the widespread availability of mobile devices, with mobile phones often more accessible than computers. In Africa, including Nigeria, this creates opportunities for delivering educational content (International Telecommunication Union, 2022). However, access alone does not guarantee effective utilization, making it necessary to examine how mobile technologies are used and the conditions influencing their effectiveness.

In Nigeria, mobile learning in higher education is still emerging, with adoption varying across institutions. Its academic use is limited by poor internet connectivity, high data costs, inadequate institutional support, infrastructure, and digital competence (Alabi, 2016). Although mobile learning enables access to materials, communication, and efficient completion of academic tasks, distractions, unreliable electricity, and limited institutional policies may reduce its effectiveness. Successful implementation therefore depends on policy, training, and infrastructure development. The ease of use associated with mobile learning can improve academic performance by reducing the time and effort required to complete academic tasks. Students can gather information, organize their work, and meet deadlines more efficiently. Consequently, understanding how mobile learning contributes to academic performance requires examining specific dimensions, particularly personalized, collaborative, social, and blended learning.

Blended learning integrates face-to-face teaching with digital and online learning experiences. It promotes student engagement, independent learning, and academic achievement (Bond et al., 2020). It combines classroom interaction with tools such as learning management systems, virtual classrooms, mobile applications, discussion forums, and multimedia resources (Hrastinski, 2021). Research indicates that it promotes active participation, learner autonomy, flexibility, self-paced learning, interaction, and collaboration (Rasheed et al., 2020). In Nigeria, its effectiveness is influenced by internet connectivity, electricity, institutional readiness, and students' digital competence (Adeleke & Emeahara, 2022).

Collaborative learning is enhanced by mobile technologies through messaging applications, discussion forums, and social learning platforms, enabling students to interact, share ideas, and participate in group activities. Interaction promotes knowledge sharing and critical thinking, while digital literacy supports access to knowledge, independent learning, communication, and collaboration. Meaningful learning occurs through the integration of social, cognitive, and teaching presence supported by communication. However, distractions and non-academic use can reduce its educational value, linking collaborative learning to the social dimension of mobile learning.

Mobile devices allow learners to tailor their learning experiences by selecting resources, controlling the pace of learning, and engaging with content that suits their preferences. Traxler (2009), mobile learning transforms education by shifting control from institutions to learners, thereby fostering independence and self-regulation. This shift is particularly important in higher education, where students are expected to take greater responsibility for their learning. However, while mobile learning offers significant advantages, it also presents challenges such as distractions, inconsistent internet connectivity, and varying levels of digital competence. These challenges underscore the importance of examining not just the availability of mobile learning but its effective utilization and effect on learning outcomes.

Statement of the Problem

Mobile learning has become increasingly important in higher education because of advances in digital technology and the need for flexible learning systems. The COVID-19 pandemic which disrupted the education of over 1.5 billion learners globally**,** accelerated the adoption of remote and mobile-based learning solutions (UNESCO, 2020). Despite the availability and advantages of mobile learning**,** including improved access to learning materials, flexibility, communication, and personalized learning, a gap persists between availability and actual academic utilization among postgraduate students in public universities. Although smartphones and mobile technologies are widely accessible, students' academic performance remains inconsistent, and it is unclear whether their utilization significantly improves academic achievement. Thus, devices intended to support learning may also become sources of distraction when not used purposefully. However, there is limited empirical evidence**,** particularly in public universities in River State on how mobile learning contributes to academic performance through specific dimensions such as in collaborative learning, blended learning and mobile learning**.** Much of the existing research focuses on mobile learning adoption rather than measuring academic outcomes. Therefore, the central problem that warrant this study is the insufficient empirical evidence on how mobile learning utilization affects academic performance of postgraduate education students in public universities in Rivers State.

Research Questions

The following research questions will guide the study:

1. What is the difference in the mean scores of postgraduate education students taught ICT in Education using blended learning and those taught using the lecture method?
2. What is the difference in the mean scores amongst postgraduate education students taught ICT in Education using collaborative learning and those taught using the lecture method?
3. What is the difference in the mean posttest scores of postgraduate education students taught using mobile learning strategies and those taught using the lecture method?

Hypotheses

The following null hypotheses was tested at 0.05 level of significance:

1. There is no significant difference in the mean scores of postgraduate education students taught ICT in Education using blended learning and those taught using the lecture method.
2. There is no significant difference in the mean scores amongst postgraduate education students taught using collaborative learning and those taught using the lecture method.
3. There is no significant difference in the adjusted posttest mean scores of postgraduate education students taught using mobile learning strategies and those taught using the lecture method after controlling for pretest scores.

METHODOLOGY

This study adopted a quasi-experimental research design, specifically the pretest-posttest non-equivalent control group design. The population of the study comprised all 700 postgraduate Education students offering Information and Communication Technology in Education in Rivers State universities, namely Ignatius Ajuru University of Education and Rivers State University in the 2025/2026 academic session. Purposive sampling was used to select Rivers State University because it offers a postgraduate Education programme in Information Technology, possesses the facilities required for mobile learning, and provides adequate internet connectivity. The entire population of 300 students in River State University was used. From the population, 150 students served as the experimental group that received instruction through the mobile learning intervention, while other intact classes comprising 150 students served as the control group and was taught using the traditional lecture method. Postgraduate Students Information and Communication Technology in Education Test (PSICTET) was used for data collection. The instrument was subjected to face and content validated by one expert in Measurement and Evaluation and two experts in Educational Technology. The reliability of the PSICTET was established through a pilot study involving postgraduate students at the University of Port Harcourt with similar characteristics to the study participants. The reliability of the instrument was determined using the Kuder-Richardson Formula 20 (KR-20) because the test items were dichotomously scored as 1 for a correct response and 0 for an incorrect response. The analysis yielded a reliability coefficient of 0.73, indicating that the instrument was reliable for the study. The instrument was administered by the researcher with the assistance of four research assistants and class coordinators. Both groups were administered the PSICTET as a pretest before the treatment to determine their initial level of knowledge. The treatment lasted four weeks, after which the same test was rearranged and administered as a posttest under the same examination conditions. The scripts were collected, scored, and used for data analysis. Both groups took the PSICTEAT as a pretest under uniform conditions, and the pretest scores served as the covariate for the ANCOVA analysis. The research questions were answered using mean and standard deviation, while the null hypotheses relating to the weekly achievement outcomes were tested using the Independent Samples *t*-test at the 0.05 level of significance.

RESULTS

Research Question 1: *What is the difference in the mean scores of postgraduate education students taught ICT in Education using blended learning and those taught using the traditional lecture method?*

Table 4.2: **Mean and Standard Deviation Analysis of Academic Achievement Scores of Postgraduate Education Students Exposed to Blended Learning and the Traditional Lecture Method**

TEACHING METHOD	N	Mean	Std. Deviation
EXPERIMENTAL GROUP	150	7.5333	1.73657
CONTROL GROUP	150	5.4733	1.76733

Table 4.2 presents the mean and standard deviation of the blended learning achievement scores of postgraduate education students in the experimental and control groups. The results show that the experimental group obtained a mean score of 7.53 (SD = 1.74), whereas the control group obtained a mean score of 5.47 (SD = 1.77). The higher mean score recorded by the experimental group indicates that postgraduate education students exposed to the mobile learning strategy incorporating blended learning performed better in the blended learning achievement test than those taught using the traditional lecture method. The mean difference of 2.06 (7.53 − 5.47) suggests that the use of blended learning was associated with improved academic performance in the blended learning component of the ICT in Education course. Therefore, based on the mean scores, postgraduate education students taught using the mobile learning strategy (blended learning) achieved higher scores than those taught using the traditional lecture method.

Research Question 2: *What is the difference in the mean scores amongst postgraduate education students taught ICT in Education using collaborative learning and those taught using the traditional lecture method?*

Table 4.3: Mean and Standard Deviation Analysis of Academic Achievement Scores of Postgraduate Education Students Exposed to Collaborative Learning and the Traditional Lecture Method

TEACHING METHOD	N	Mean	Std. Deviation
EXPERIMENTAL GROUP	150	7.5333	1.82697
CONTROL GROUP	150	5.3933	1.74131

Table 4.3 presents the mean and standard deviation of the collaborative learning achievement scores of postgraduate education students in the experimental and control groups. The results reveal that the experimental group obtained a mean score of 7.53 (SD = 1.83), while the control group obtained a mean score of 5.39 (SD = 1.74). The higher mean score recorded by the experimental group indicates that postgraduate education students exposed to the mobile learning strategy incorporating collaborative learning performed better in the achievement test than those taught using the traditional lecture method. The mean difference of 2.14 (7.53 − 5.39) suggests that the use of collaborative learning was associated with improved academic performance in the collaborative learning component of the ICT in Education course. Therefore, based on the mean scores, postgraduate education students taught using the mobile learning strategy (collaborative learning) achieved higher scores than those taught using the traditional lecture method.

Research Question 3: *What is the difference in the mean posttest scores of postgraduate education students taught using mobile learning strategies and those taught using the traditional lecture method?*

Table 4.6: Descriptive Statistics of Posttest Academic Achievement Scores of Postgraduate Education Students in the Experimental Group and the Control Group.

Descriptive Statistics

Dependent Variable: POST TEST SCORE

TEACHING METHOD	N	Mean	Std. Deviation
EXPERIMENTAL GROUP	150	26.1133	6.44703
CONTROL GROUP	150	22.5733	4.20825

Estimates

Dependent Variable: POST TEST SCORE

TEACHING METHOD	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
EXPERIMENTAL GROUP	26.112[a]	.445	25.236	26.989
CONTROL GROUP	22.574[a]	.445	21.698	23.451

a. Covariates appearing in the model are evaluated at the following values: PRETEST SCORE = 12.6000.

Table 4.6 shows that the experimental group (Mean = 26.11, SD = 6.45) achieved a higher posttest score than the control group (Mean = 22.57, SD = 4.21), with a mean difference of 3.54 points, indicating improved achievement following the mobile learning intervention. After controlling for pretest scores using ANCOVA, the experimental group had a higher adjusted mean (26.112) than the control group (22.574). The adjusted mean difference of 3.538 was statistically significant ($p < .001$), confirming that

the four-week mobile learning intervention significantly improved students' academic achievement compared with the conventional teaching method.

Hypotheses

Hypothesis 1: There is no significant difference in the mean scores of postgraduate education students taught ICT in Education using blended learning and those taught using the traditional lecture method.

Table 4.8: Independent Samples t-Test Analysis of Academic Achievement Scores of Postgraduate Education Students Exposed to Blended Learning and the Traditional Lecture Method

T-Test

Group Statistics

	TEACHING METHOD	N	Mean	Std. Deviation	Std. Error Mean
BLENDED LEARNING SCORE	EXPERIMENTAL GROUP	150	7.5333	1.73657	.14179
	CONTROL GROUP	150	5.4733	1.76733	.14430

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BLENDED LEARNING SCORE	Equal variances assumed	.021	.885	10.183	298	<.001	2.06000	.20231	1.66187	2.45813
	Equal variances not assumed			10.183	297.908	<.001	2.06000	.20231	1.66187	2.45813

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
BLENDED LEARNING SCORE	Cohen's d	1.75201	1.176	.930	1.420
	Hedges' correction	1.75644	1.173	.927	1.417
	Glass's delta	1.76733	1.166	.902	1.426

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

Table 4.8 shows that Levene's Test indicated equal variances between the groups, $F = 0.021$, $p = .885$. The experimental group had a higher mean score (M = 7.53) than the control group (M = 5.47), with a mean difference of 2.06 and a 95% confidence interval of 1.66–2.46. The Independent Samples *t*-test showed a statistically significant difference, $t(298) = 10.183$, $p < .001$. Therefore, the null hypothesis was rejected, indicating that students taught using blended learning performed significantly better than those taught using the traditional lecture method.

Hypotheses 2: There is no significant difference in the mean scores amongst postgraduate education students taught using collaborative learning and those taught using the traditional lecture method.

Table 4.9: Independent Samples T-Test Analysis of Academic Achievement Scores of Postgraduate Education Students Exposed to Collaborative Learning and the Traditional Lecture Method
T-test

Group Statistics

	TEACHING METHOD	N	Mean	Std. Deviation	Std. Error Mean
COLLABORATIVE LEARNING SCORE	EXPERIMENTAL GROUP	150	7.5333	1.82697	.14917
	CONTROL GROUP	150	5.3933	1.74131	.14218

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
COLLABORATIVE LEARNING SCORE	Equal variances assumed	.579	.447	10.385	298	<.001	2.14000	.20607	1.73446	2.54554
	Equal variances not assumed			10.385	297.316	<.001	2.14000	.20607	1.73445	2.54555

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
COLLABORATIVE LEARNING SCORE	Cohen's d	1.78465	1.199	.952	1.444
	Hedges' correction	1.78916	1.196	.950	1.441
	Glass's delta	1.74131	1.229	.962	1.493

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

Table 4.9 shows that Levene's Test confirmed equal variances, $F = 0.579$, $p = .447$. The experimental group recorded a mean difference of 2.14 points over the control group, with a 95% confidence interval of 1.734–2.546, which excluded zero. The Independent Samples *t*-test revealed a statistically significant difference, $t(298) = 10.385$, $p < .001$. Therefore, the null hypothesis was rejected, indicating that postgraduate education students taught using collaborative learning performed significantly better than those taught using the traditional lecture method.

Education students taught ICT in Education using social learning and those taught using the traditional lecture method.

Hypotheses 3: There is no significant difference in the adjusted posttest mean scores of postgraduate education students taught using mobile learning strategies and those taught using the traditional lecture method after controlling for pretest scores.

Table 4.12: Analysis of Covariance (ANCOVA) of the Overall Effect of Mobile Learning on Postgraduate Education Students' Posttest Academic Achievement Scores

Tests of Between-Subjects Effects

Dependent Variable: POST TEST SCORE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	940.171[a]	2	470.086	15.809	<.001	.096
Intercept	20314.513	1	20314.513	683.172	<.001	.697
PRETEST	.301	1	.301	.010	.920	.000
GROUP	937.495	1	937.495	31.528	<.001	.096
Error	8831.466	297	29.736			
Total	187551.000	300				
Corrected Total	9771.637	299				

a. R Squared = .096 (Adjusted R Squared = .090)

Parameter Estimates

Dependent Variable: POST TEST SCORE

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	22.663	.996	22.747	<.001	20.702	24.624	.635
PRETEST	-.007	.070	-.101	.920	-.144	.130	.000
[GROUP=1.00]	3.538	.630	5.615	<.001	2.298	4.778	.096
[GROUP=2.00]	0[a]	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

Estimated Marginal Means

TEACHING METHOD

Estimates

Dependent Variable: POST TEST SCORE

TEACHING METHOD	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
EXPERIMENTAL GROUP	26.112[a]	.445	25.236	26.989
CONTROL GROUP	22.574[a]	.445	21.698	23.451

a. Covariates appearing in the model are evaluated at the following values: PRETEST SCORE = 12.6000.

Pairwise Comparisons

Dependent Variable: POST TEST SCORE

(I) TEACHING METHOD	(J) TEACHING METHOD	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
EXPERIMENTAL GROUP	CONTROL GROUP	3.538*	.630	<.001	2.298	4.778
CONTROL GROUP	EXPERIMENTAL GROUP	-3.538*	.630	<.001	-4.778	-2.298

Based on estimated marginal means

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

b. Adjustment for multiple comparisons: Bonferroni.

Table 4.12 shows that, after controlling for pretest scores, teaching method had a statistically significant effect on students' posttest achievement, $F(1, 297) = 31.528$, $p < .001$, Partial $\eta^2 = .096$. The effect size indicates that the teaching method explained 9.6% of the variance in posttest achievement, representing a moderate practical effect. The experimental group scored 3.538 points higher than the control group after adjustment (B = 3.538, $t = 5.615$, $p < .001$; 95% CI = 2.298–4.778), which was confirmed by the Bonferroni-adjusted pairwise comparison ($p < .001$). Therefore, the null hypothesis was rejected, indicating that the four-week mobile learning intervention significantly improved students' academic achievement compared with the conventional teaching method.

DISCUSSION OF FINDINGS

Blended Learning and Students' Academic Performance

The study found that blended learning significantly improved students' academic performance compared with traditional lectures, by enhancing engagement, flexibility, interaction, and access to learning resources. This agrees with Alabdulkareem (2021), Sung et al. (2021), and Nikolopoulou (2022), who reported positive effects of mobile learning on achievement and engagement. In Nigeria, the finding corroborates Adeleke and Emeahara (2022) and Afolabi and Akinbobola (2022), who linked digital learning exposure with improved participation and educational outcomes. The study is unique in using a four-week quasi-experimental design and achievement tests among postgraduate education students in public universities in Rivers State.

Collaborative Learning and Students' Academic Performance

The study revealed that collaborative learning significantly improved academic achievement, as students exposed to mobile-supported collaboration performed better than those taught conventionally. This agrees with Bond et al. (2020), Panadero (2020), Hrastinski (2021) and Radkowitsch et al. (2020), who found that digital collaboration promotes interaction, engagement, knowledge construction, and achievement. The study's uniqueness lies in its quasi-experimental pretest-posttest design, achievement-test measurement, and examination of collaborative learning as one of four mobile learning components in an actual classroom setting.

Mobile Learning and Students' Academic Performance

The findings of this study revealed that mobile learning strategies improved students' academic achievement compared with the conventional teaching method. The positive effect observed in this study can be explained by the instructional structure of the intervention, which sequentially integrated blended learning, collaborative learning, personalized learning, and social learning using mobile technologies. The findings are consistent with those of Tang and Hew (2022), who reported that mobile instant messaging used as a structured instructional tool significantly improved students' behavioural, emotional, and cognitive engagement as well as learning outcomes in higher education. Similarly, the present findings agree with Ng et al. (2020), who found that students who participated in guided mobile learning activities significantly outperformed those receiving conventional instruction.

CONCLUSION

The study concludes that structured mobile learning significantly improves the academic achievement of postgraduate Education students offering Information Technology. The four intervention components, such as blended, collaborative, personalized, and social learning, consistently produced higher achievement than conventional teaching. ANCOVA confirmed that the improvement remained significant after controlling for pretest scores. The findings show that the effectiveness of mobile learning depends not merely on the availability of mobile devices but on their deliberate integration with sound pedagogical practices.

RECOMMENDATIONS

1. Teachers should integrate blended, collaborative, personalized, and social mobile learning strategies into instruction delivery.
2. School administrators should develop policies that support responsible and ethical educational use of mobile devices.
3. Rivers State Ministry of Education should provide regular professional development on effective mobile learning implementation.

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