

Investigating the impact of Eko Excel tablets on primary school mathematics performance: A quasi-experimental study in Nigeria

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Abstract

This research investigated the impact of utilising the Tablet on the Primary school pupils' performance in mathematics. Three hypotheses guided the study, and the quasi-experimental design involving pre-test and post-test was used. 150 primary four pupils from schools in Lagos state participated in the study. Mathematics Achievement Test (MAT) was used for data collection. This assessment tool exhibited a satisfactory level of reliability, indicated by a coefficient of 0.73. The hypotheses were scrutinized through analysis of covariance (ANCOVA). The results indicated a substantial enhancement in mathematics scores when employing Eko Excel Tablets in contrast to conventional teaching approach. Gender had no discernible impact on mathematics performance among pupils using these tablets. Suggestions were made to oversee the integration of tablets in school curricula by the Lagos State Universal Basic Education Board (LASUBEB) to foster improved academic outcomes among pupils.

Questa ricerca ha indagato l'impatto dell'utilizzo del Tablet sul rendimento in matematica degli alunni della scuola primaria. Tre ipotesi hanno guidato lo studio ed è stato utilizzato un disegno quasi sperimentale che coinvolge pre-test e post-test. Allo studio hanno partecipato 150 alunni delle scuole primarie dello stato di Lagos. Per la raccolta dei dati è stato utilizzato il Mathematics Achievement Test (MAT). Questo strumento di valutazione ha mostrato un livello di affidabilità soddisfacente, indicato da un coefficiente di 0,73. Le ipotesi sono state esaminate attraverso l'analisi della covarianza (ANCOVA). I risultati hanno indicato un miglioramento sostanziale nei punteggi di matematica quando si utilizzano i tablet Eko Excel rispetto all'approccio didattico convenzionale. Il genere non ha avuto alcun impatto evidente sul rendimento in matematica degli alunni che utilizzavano questi tablet. Sono stati avanzati suggerimenti per supervisionare l'integrazione dei tablet nei

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programmi scolastici da parte del Lagos State Universal Basic Education Board (LASUBEB) per promuovere migliori risultati scolastici tra gli alunni.

Keywords: Eko Excel tablet; mathematics achievement test; primary school; gender

Parole chiave: tablet Eko Excel; test di rendimento in matematica; scuola primaria; genere

1. Introduction

The initial stage of formal education is referred to as primary school. It serves as a preparatory stage where the fundamental knowledge is established and developed for subsequent academic pursuits (Okeke, 2016). Elementary education provides students with foundational knowledge and skills essential for future learning, notably in subjects like mathematics. It forms the basis for their academic development, as highlighted by the National Policy on Education (FRN, 2013), emphasizing its pivotal role in the educational system (Nwoye et al. 2020). The aims of primary education involve instilling permanent literacy and numeracy, establishing the groundwork for national progress, and providing children with opportunities to cultivate practical and scientific abilities that will enable them to function proficiently within the society (FRN, 2013). This indicates a strong necessity to effectively instruct mathematics at the elementary school level, utilizing technology to establish a solid foundation for further education. Incorporating primary mathematics into the curriculum extensively exposes pupils to the essential skills and operations necessary for understanding the subject thoroughly.

Mathematics plays a vital role in the enhancement of skills and the cultivation of logical reasoning in human endeavours, making it an indispensable subject (Shu'ibabu & Sidi, 2020). The successful progress of any nation relies heavily on the utilization of mathematics as a fundamental tool. At the heart of education, mathematics is pivotal for enhancing students' cognitive skills, fostering skill development, and promoting problem-solving proficiency (Malik & Salman, 2018). Research by Malik et al. (2020) opined that in preparing individuals for both academic excellence and practical societal engagement, mathematics provides a strong and essential foundation during their formative years in basic education.

Despite the daily teaching of mathematics in primary schools, mathematicians are troubled by the lack of interest and achievement among pupils in this subject. According to Salman (2009), as cited in a study by Malik and Salman (2016), Nigerian pupils' consistent under-performance in mathematics can be linked to teachers' insufficient subject knowledge and ineffective teaching methods. Malik and Salman (2016) confirmed that the integration of technology in mathematics instruction has the potential to enhance pupils' interest and comprehension of the subject, thereby reducing or eliminating the rate of failure.

In recent years, the integration of technology into mathematics teaching has gained significant traction. According to the study by Tatar, Akkaya and Kagizmanli (2014), this approach offers numerous advantages, such as fostering interactive and captivating learning experiences, aiding in the visualization of mathematical ideas, and enhancing problem-solving abilities. Moreover, technology encourages active participation among learners by promoting classroom interactions and enabling swift feedback and monitoring of students' academic performance and progress, thus facilitating prompt correction (Mantoro et al., 2017). Incorporating technology, like the Eko Excel Tablets, into mathematics education has shown potential to enhance the academic performance of elementary school students in Lagos State. As a response, the Lagos State Government introduced Eko-Excel in December 2019, an initiative named Excellence in Child Education and Learning (Eko-Excel). This initiative aims to revamp public primary schools in the state and enhances teaching approaches to align with modern educational needs. Additionally, it seeks to modernize all government primary schools by equipping teachers with state-of-the-art technology. The initiative aims to enhance educators' methods by improving content delivery, classroom management, and addressing disruptions. In collaboration with Bridge International and its technical partner, the Lagos State Universal Basic Education Board (LASUBEB) has trained over 4,000 teachers from its 1,017 public primary schools since 2020, aiming to cultivate a highly skilled and competent workforce (Malik & Saddiq, 2024).

Eko-Excel aims to enhance confidence in the public education system of the state by providing training, support, and motivation to teachers, thereby increasing their competence in the classroom. This endeavour is expected to yield positive outcomes in terms of students' academic performance. In response to the declining standard of public education nationwide, numerous parents have chosen to enrol their children in private schools, including those with low fees, despite operating in challenging environments with underqualified teachers. However, governments at different levels have introduced several measures over the years to counter this trend and encourage more students to attend public schools. The recent initiative by the Lagos State Government, called Excellence in Child Education and Learning (Eko-Excel), has been praised as a positive step forward.

Investing in basic education is crucial for Lagos to thrive as a 21st-century economy in Africa. Eko Excel, a modern educational technology initiative, enhances teaching and learning in primary schools, positioning Lagos as a leading global education system. Benefits include empowered teachers, continuous support for improvement in reading and literacy skills, and enhanced professionalism and technological proficiency among educators, creating a positive learning environment for students. This marks a significant advancement for Lagos State and the Lagos State Universal Basic Education Board (LASUBEB).

These achievements owe much to Governor Sanwo-Olu's unwavering commitment to education improvement, coupled with the support from a reputable Nigerian technical partner. Sanwo-Olu's significant investment in education, allocating a substantial portion of the 2022 budget, totalling N171.6 billion (12.3 per cent), underscores this dedication. This investment has yielded tangible results, as evidenced by verifiable data and recognition from global and national organizations. Notably, Eko-Excel received acclaim at the 2021 Education Alliance Symposium in the US. The Eko Excel initiative by the Lagos State government has effectively tackled truancy and enhanced attendance among teachers and pupils in public primary schools. Since its launch, teaching and learning in Lagos State's public primary schools have transformed, thanks to Eko Excel (Excellence in Child Education and Learning), the state's technology-driven initiative aimed at improving learning outcomes (This Day Newspaper, 2019, as cited in Malik & Saddiq, 2024).

The goal is to support educators in integrating the Eko Excel tablet into their classrooms, allowing the technology to significantly impact the learning process. However, the integration of technology into education should reflect its pervasive influence, especially as it should seek to elevate primary school outcomes by transforming learning in all classrooms and ensuring that every child has access to excellent and well supported teachers (Abdulazeez et. al., 2024). Also, Niyibizi and Mutarutinya (2024) in their study conducted in Rwanda found out that the majority of secondary mathematics teachers use of ICT facilities to support the teaching of mathematics. To increase the use of ICT facilities in secondary schools, it is advised that teachers keep utilizing technology in the classroom.

The introduction of EKO EXCEL seeks to, among other objectives, increase confidence in the state public education system by developing more skilled teachers through training, supporting, and motivating them to succeed in their classrooms (Malik & Saddiq, 2024). Consequently, the government would achieve and evaluate the advancement in academic performance within public elementary schools. The government aspires that through the implementation of this approach, schools will become more enticing to students from diverse backgrounds, equipping them adequately at this cognitive stage. Similarly, the state has initiated teacher training initiatives emphasizing innovative thinking and research-based teaching methods, integrating technology into curriculum development. This ensures that every student develops innovative thinking skills and remarkable capabilities, acquiring digital literacy by the end of their foundational education. Through these bold initiatives, the Lagos State Government is gradually restoring trust in the state's public primary school system.

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Consequently, this study investigated the impact of the Eko Excel Tablet on mathematics achievement in Lagos State (Malik & Saddiq, 2024). Therefore, the objectives of this study are to investigate the effect of utilizing Eko-Excel Tablet on primary school pupils' mathematics performance in Lagos State, Nigeria; and examine the influence of gender on the utilization of Eko-Excel Tablet on primary school pupils' mathematics performance in Lagos State, Nigeria.

2. Research hypotheses

The following null hypotheses were raised and tested in this study.

H01: There is no significant main effect of utilizing the Eko-Excel Tablet on primary school pupils' mathematics performance in Lagos State, Nigeria.

H02: There is no significant main effect of gender on primary school pupils' mathematics performance in Lagos State, Nigeria.

H03: There is no significant interaction effect of the treatment and gender on primary school pupils' mathematics performance in Lagos State, Nigeria.

3. Methods

The study employed a quasi-experimental research design involving pre-test and post-test. From a pool of primary schools in Epe Local Government Area, Lagos State, two schools were selected through purposive sampling technique: one for experimental and the other for control. From the two schools, 150 primary four students from two intact classes were involved in the study, with 90 utilising the Eko Excel Tablets (comprising 46 females and 44 male students) and 60 constituting the control group of equal numbers of 30 males and females. The experiment was carried out for 5 weeks. The pre-test score was taken before the commencement of the treatment and the post-test score was taken at the end of the treatment using the Mathematics Achievement Test (MAT). The choice of primary four pupils was considered for maximum concentration because, at that level, pupils would be willing to learn with any innovative approach that can boost their performance at the final examinations for the primary school leaving certificate in a future year. The test instrument used for this study titled "Mathematics Achievement Test (MAT) of 50 multiple choice questions was carefully compiled from past examination questions of the Lagos State Examination Board. This assessment tool exhibited a satisfactory level of reliability, indicated by a coefficient of 0.73. To tackle the research questions, the study utilized means and bar charts for data interpretation, while hypotheses were scrutinized through analysis of covariance (ANCOVA).

4. Results

The null hypotheses were tested at a 0.05 level of significance.

Hypothesis one

There is no significant effect of utilizing the Eko-Excel Tablet on primary school pupils' mathematics performance in Lagos State, Nigeria.

The finding of the study displayed in table 1 below shows that there was a significant effect of the intervention on the performance of pupils in mathematics.

Table 1. ANCOVA table on the effect of Eko-Excel Tables on the Performance of primary school pupils in mathematics

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	304.969 ^a	4	76.242	39.715	0.00	0.523	
Intercept	737.255	1	737.255	384.036	0.00	0.726	
Pretest	0.55	1	0.55	0.287	0.593	0.002	
Group	292.742	1	292.742	152.489	0.00	0.513	
Gender	3.601	2	3.601	1.876	0.173	0.013	
Group*Gender	7.032	3	4.203	.927	0.713	0.205	
Total	26456						
Corrected Total	583.333	149					

a. R Squared = .523 (Adjusted R Squared = .510)

Table 1 shows the ANCOVA analysis yielded a significant result, with $F(1, 145) = 152.49$; $p < 0.05$, indicating the substantial impact of the Eko Excel Tablet on primary school pupils' mathematics performance. As a result, the initial null hypothesis was rejected. This implies that the enhanced performance of pupils in the experimental group can be attributed to the utilization of the Eko Excel Tablet, as evidenced by the findings presented in Table 1.

Hypotheses two

There is no significant effect of gender on primary school pupils' mathematics performance in Lagos State, Nigeria.

Table 1 presents the ANCOVA outcome, with $F(2, 145) = 1.88$; $p > 0.05$, indicating no significant impact of gender (male and female) on the average performance of primary school pupils in mathematics when utilizing Eko Excel Tablets. Consequently, the second null hypothesis was not rejected. This suggests that the superior performance of primary school pupils in the experimental group was not influenced by the pupils' gender.

Hypothesis three

There is no significant interaction effect of the treatment and gender on primary school pupils' mathematics performance in Lagos State, Nigeria.

Finding of the study as displayed in table 1 shows that there is no significant interaction effect of the treatment (coined as group) and gender on the pupils' performance in mathematics, $F(3, 145) = .927$; $p > 0.05$. This shows that the third null hypothesis was not rejected. Therefore, this revealed that the pupils' performance in the experimental group was not affected by the interaction effect of the treatment and gender.

5. Discussion

A notable contrast in achievement emerged between pupils instructed in mathematics using Eko Excel Tablets and those taught through conventional method, indicating a substantial impact of Eko Excel Tablets on pupils' mean achievement scores in mathematics. This finding aligns with the research by Fabian et al. (2018), which revealed that students utilizing mobile devices exhibited improved performance in mathematics. Similarly,

Pakpahan and Rajagukguk's (2023) study showed that pupils instructed in mathematics through mobile learning media outperformed those exposed to traditional learning approaches. Malik and Salman (2016) found that pupils exposed to BridgeIT mobile applications performed better than those taught mathematics conventionally. This conclusion was reinforced by Malik et al.'s (2021) study, indicating that students instructed with mathematical laboratory equipment for numbers and numeration outperformed those in traditional approach. Similarly, Malik and Saddiq (2024) observed that pupils taught with Eko Excel tablets surpassed those instructed in mathematics using traditional method. Abdulazeez et. al. (2024) in similar research on the KWARA-LEARN initiative found out that the use of the tablets among teachers in the primary schools have also improve teaching proficiency as well as have a positive influence on science teaching. Using the Kwara LEARN tablet in their classes, teachers have reported that their content understanding of science (mathematics inclusive) has increased and that they feel more at ease using it (Abdulazeez et. al., 2024).

The research revealed that gender did not significantly influence the mean achievement scores of primary school students instructed in mathematics using Eko Excel Tablets. This discovery aligns with Rabiou et al's (2016) observation that gender did not play a significant role in cell phone usage and academic achievement among senior secondary school students. Similarly, Malik and Salman (2016), Saddiq et al. (2017), Malik et al. (2019), Malik et al. (2021), and Malik and Saddiq (2024) found no substantial gender effect on students' mathematics performance when exposed to technology.

6. Conclusion

The findings of this study suggest that integrating Eko Excel Tablets into mathematics instruction improves pupils' mathematical proficiency, enabling them to grasp and retain mathematical concepts effectively. Additionally, the analysis indicated that gender did not influence the mean achievement scores of primary school pupils in the experimental group, indicating equal learning opportunities for both male and female students. Overall, the utilization of technology, such as Eko Excel Tablets, holds promise for enhancing the academic performance of elementary pupils in mathematics.

7. Recommendations

Based on the study's findings, the following recommendations are proposed:

1. The Lagos State Universal Basic Education Board (LASUBEB) should ensure the effective deployment of Eko Excel Tablets across all schools.
2. The government should engage pupils, teachers, and school administrators in annual assessments of Eko Excel Tablets through discussions, seminars, and training workshops.

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