

Assessment of Teachers' Awareness and Use of Blended Teaching Methods for Mathematics Instruction in Senior Secondary Schools in Kogi-East, Nigeria

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Abstract

This study evaluated senior secondary school teachers' knowledge of and use of blended learning strategies. The study was carried out in Kogi-East, Nigeria, using a descriptive survey research design. Using a straightforward random sampling method, 200 math teachers were chosen from a population of 254 teachers. Three experts validated the questionnaire, which consisted of two sections. For awareness, the reliability coefficient was 0.82, and for blended learning, it was 0.78. The research questions were addressed using the mean and standard deviation, and a t-test was used to test the hypothesis. It was discovered that math teachers had a low level of application of blended learning and only a partial awareness of it. Secondary school administrators should host seminars or workshops to raise teachers' awareness of blended learning strategies and help them apply them considering the study's conclusions.

Keywords: Assessment, Teacher, Awareness and Application, Blended Teaching Method and Mathematics.

Introduction

Mathematics is defined as the scientific exploration of quantities, encompassing their relationships, operations, and measurements represented through numbers and symbols. It can also be characterized as the logical examination of numbers, shapes, arrangements, quantities, and various related concepts. Mathematics is widely acknowledged as a foundational discipline that supports scientific and technological progress. In Nigeria, at the senior secondary school level, mathematics is a mandatory subject and a prerequisite for entry into numerous science and technology-related fields. Despite its significance to both learners and society, students' performance in mathematics during external examinations, particularly those administered by the West African Examination Council (WAEC), has consistently fallen short of expectations (Bello, Moyi & Ginga, 2025). This ongoing underachievement, as noted in the WAEC chief examiner's report (2023 - 2025), has been linked to several factors, including the reliance on traditional teaching methods. These methods are predominantly teacher-centered and fail to actively engage students in the teaching and learning process (Egara &

Mosimege, 2024). Consequently, to enhance students' participation and success in mathematics, it is essential to implement technology-based teaching strategies.

The swift progress in Information and Communication Technology (ICT) has profoundly altered educational practices worldwide. A prominent innovation in this realm is the blended teaching method. This pedagogical approach merges traditional in-person instruction with digital and online learning modalities. Based on this premise, Sanders and Mukhari (2024) characterize the blended teaching method as an instructional strategy wherein educators intentionally combine face-to-face and digital learning environments to enhance teaching effectiveness and student learning, necessitating sufficient institutional support and teacher readiness. In essence, it transcends the sporadic use of technology; it represents a purposeful integration of physical classroom engagement and technology-enhanced learning aimed at improving teaching efficacy and student learning outcomes. Furthermore, Jailani, Rosli, and Mahmud (2024) describe the blended instructional approach as the amalgamation

of digital tools with in-person teaching to foster an interactive, flexible, and student-centered learning environment. This definition emphasizes learner autonomy and flexibility as fundamental characteristics.

Blended teaching provides opportunities for interactive learning, flexibility and improved access to instructional resources. In mathematics education, where many concepts are abstract, the use of digital tools such as simulations, instructional videos, virtual problem solving platforms and interactive software can enhance students' conceptual understanding and engagement (Egara & Mosimege, 2024). Teachers' awareness of blended teaching methods can be described as their knowledge, understanding and perception of the approach in line with effective classroom teaching and learning. These indices play significant roles in determining its adoption and effective use in the classroom. Studies have shown that while many teachers are familiar with basic technological tools, they often lack adequate knowledge of how to integrate these tools pedagogically into blended learning environments (Zakariya, Danlami & Shogbesan, 2024). This indicates that mere awareness is inadequate; it must be supplemented by professional development and institutional backing. This gap between technological awareness and pedagogical application can limit the effectiveness of implementation of blended teaching method in improving learning outcomes.

Furthermore, the application of blended teaching involves the practical use of digital tools or online platforms alongside traditional teaching methods in delivering instruction. The application of this teaching method in Kogi-East senior secondary schools may be influenced by several contextual factors. These factors encompass inadequate ICT infrastructure, subpar internet connectivity, restricted access to digital devices, and a lack of sufficient professional training for educators, among others. In line with these setbacks, teachers may be aware of blended teaching method but are unable to apply it effectively due to these constraints. Consequently, the potential benefits of blended teaching and learning in improving students' achievement and interest in mathematics may not be fully realized. Previous empirical studies conducted provide deeper insights into blended teaching methods in mathematics and its effect in improving students' learning outcomes. Although, most of these studies focused broadly on teachers' technology integration in teaching and students' learning outcomes. For example, a study conducted by Ekeh, Venketsamy, Unamba, and Ugochukwu (2021) investigated the implementation of blended learning in mathematics instruction within

Imo State. The results of the study indicated that educators who utilized blended learning approaches enhanced students' comprehension and performance in mathematical concepts. However, the researchers emphasized that many teachers still relied on traditional teaching methods due to limited awareness and training in blended pedagogy. This indicates that although the blended teaching method proves to be effective, its successful implementation is heavily reliant on the preparedness of educators. In a similar vein, Nwoke (2023) examined the impact of blended e-learning on pre-service mathematics teachers in Imo State. The findings of the study revealed that engagement with blended teaching substantially enhanced teachers' competence and their readiness to teach mathematics proficiently. This implies that improving teachers' awareness through training enhances their ability to apply blended teaching methods.

However, some limitations are faced by teachers' applications of this method of teaching. According to Anakpua, Nzeakor, Emefo and Okeke (2023) who investigated mathematics teachers' perceptions and challenges in applying blended teaching method in Anambra State. The study revealed that teachers had positive awareness of blended teaching and recognized its effectiveness in mathematics instruction. However, the practical implementation was limited by issues such as unreliable internet access, insufficient digital devices, and a lack of adequate professional training. This deficiency limits both awareness and effective application of innovative teaching methods. However, previous studies conducted during and after the COVID-19 period highlight the growing relevance of blended teaching. Based on this premise, Egara and Mosimege (2024) indicated that blended learning has a substantial positive effect on students' performance and retention in mathematics. These researchers emphasized that its success depends largely on teachers' ability to integrate digital tools effectively into classroom practices.

Beyond mathematics, related studies in science education also provided supporting evidence. For instance, Onyenma and Olele (2020) discovered that the implementation of blended learning significantly enhanced students' retention in Physics, indicating that educators who proficiently utilize blended teaching methods can improve learning outcomes in various STEM disciplines. This has implications for mathematics teaching, given the similarities in instructional demands.

From the foregoing, teachers generally demonstrate basic to moderate levels of awareness of blended teaching and digital tools in their classrooms

practices, but this in terms of applications is relatively from low to moderate. Since many teachers still rely on traditional teaching methods. Therefore, there is a clear gap between what teachers know and what they practice in the classrooms. Thus, the impact of blended teaching method if effectively applied in mathematics teaching and learning include improvement in students' academic achievement, enhances retention, promote engagement and conceptual understanding. Despite the increasing volume of research on the integration of technology in mathematics education, particularly regarding blended teaching methods in Nigeria.. There exist limited studies focusing specifically on senior secondary school mathematics teachers, and insufficient research linking teachers' awareness directly to their classroom applications. The lack of studies examining both awareness and application simultaneously within the same study context and poor achievement of students in mathematics prompted the researcher into the assessment of the extent of the awareness and implementation of blended teaching methods by mathematics educators in senior secondary schools located in Kogi-East, Nigeria.

Statement of the Problem

The West African Examination Council (WAEC) chief examiner's report for the years 2023 to 2025 states that there has been a consistent pattern of students exhibiting deficiencies in specific areas of mathematics, leading to poor outcomes in the subject. The areas of students' weaknesses were attributed to both teachers and learners factors. Efforts by researchers and relevant examination bodies in curtailing this challenge failed in yielding effective result. Therefore, overlooking this abnormality causes more harm than good, since mathematics is one of the compulsory subjects which students must have at least credit pass to be admitted to higher institution to study science and technological related courses. Moreover, students' achievement in this subject needs to be improved in order to actively participate to a large extent in the advancement in science and technology of our dream. One of the great problems that affect students' achievement in any subject most especially mathematics is teachers method of teaching. Therefore, mathematics teachers' awareness and use of blended teaching method is paramount. Consequently, the focus of this study is to determine the degree to which teachers in Kogi-East Nigeria are aware of and implement blended teaching methods in the instruction and learning of mathematics?

Research Questions

This study was guided by the following research questions.:

1. What is the extent of teachers' awareness of blended teaching method for effective teaching and learning of mathematics?
2. What are the mean rating response of teachers' awareness of blended teaching method for effective teaching and learning of mathematics based on gender?
3. To what extent do teachers' apply blended teaching method in teaching and learning of mathematics?
4. What are the mean rating response of teachers' applications of blended teaching method for effective teaching and learning of mathematics based on gender?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance;

HO₁: There is no significant difference in the mean response of male and female teachers on awareness of blended teaching method for teaching and learning of mathematics.

HO₂: There is no significant difference in the mean response of male and female teachers on applications of blended teaching method for teaching and learning of mathematics

Method

This study assessed the level of knowledge and application of blended learning in mathematics education in senior secondary schools in Kogi-East, Nigeria, using a descriptive survey design. The 254 math teachers in public secondary schools for the 2025–2026 academic year made up the study population, according to the Statistics Unit of the Ministry of Education (MOE) in Lokoja, Kogi State in 2026. The Yamane (1976) formula was used to determine the sample size of 200 math teachers (158 female and 42 male), and the sample was chosen using a straightforward random sampling technique (Balloting with Replacement). For data collection, teachers were asked to complete a questionnaire titled, Teachers' Awareness and Applications of Blended Teaching Method for Teaching and Learning of Mathematics (TAABTMTLM). Based on a 4-point Likert scale, the TAABTMTLM included four possible answers: Strongly Agree (4), Strongly Disagree (1), and No Agree (1). There were two sections in the instrument: A (demographic variables) and B (subdivided into two clusters: Cluster-1 (teacher awareness of blended teaching methodology) and Cluster-2 (degree to which teachers applied

blended teaching methodology to mathematics teaching and learning). Three research, measurement, and evaluation specialists from the University of Nigeria, Nsukka's Faculty of Education performed a face validity test. Cronbach alpha was computed to assess internal consistency, and the results were 0.82 for awareness and 0.78 for

blended learning. A face-to-face data collection method was used, with the researcher collecting completed questionnaires on the same day as the data collection. The research questions were answered using mean and standard deviation, and the hypotheses were tested based on the assumptions of the t-test at a 0.05 level of significance.

Results

Research Question One: What is the extent of teachers' awareness of blended teaching method for effective teaching and learning of mathematics?

Table 1: the mean and standard deviation of teachers' responses regarding their knowledge of the blended learning approach for efficient math instruction.

S/N	Item Statement	N	Mean	SD	Decision
1	I know what blended teaching means	200	3.08	.76	VMA
2	I understand there exist a face to face and online instruction	200	3.13	.74	VMA
3	I am aware of different models of blended instruction	200	1.97	.76	PA
4	I know how blended teaching can be applied in mathematics instruction	200	1.94	.73	PA
5	I am aware of digital tools used in blended teaching	200	2.30	.97	PA
6	I am familiar with online teaching platforms	200	2.35	.84	PA
7	I am aware of the benefits of blended teaching for students	200	2.42	.97	PA
8	I understand the role of teachers in blended instruction	200	2.07	.73	PA
9	I know that blended teaching supports individualized learning	200	2.09	.93	PA
10	I know how to assess students using blended teaching method	200	1.98	.93	PA
Cluster Mean		200	2.33	.10	PA

key: Not Aware (NA) = 1.00-1.49, Partially Aware (PA) = 1.50-2.49 and Very Much Aware (VMA) = 2.50 and above

The findings presented in Table 1 illustrate the level of teachers' awareness regarding the blended teaching method for the effective instruction and learning of mathematics. The cluster mean value of 2.33 falls within the real limit of 1.50 – 2.49, suggesting that teachers possess a partial awareness

of the blended teaching method for effective mathematics education. Furthermore, the cluster standard deviation varied between 0.73 and 0.97, indicating a homogeneity among the respondents' answers.

Research Question Two: What are the mean rating response of teachers' awareness of blended teaching method for effective teaching and learning of mathematics based on gender?

Table 2: Gender difference on the mean rating scores of teachers' awareness of blended teaching method for effective teaching and learning of mathematics

Gender of Teachers	N	Mean	Std. Deviation
Male	158	2.3791	.34715
Female	42	2.1476	.28986



Table 2 presented above illustrates the average ratings regarding teachers' awareness of the blended teaching method for effective mathematics instruction, categorized by gender. According to the data, male teachers exhibit a mean rating of 2.3791, which marginally exceeds the female teachers' mean rating

of 2.1476. Nevertheless, both ratings fall short of the decision mean of 2.50. This indicates that both male and female mathematics educators have a limited awareness of the blended teaching method for the instruction and learning of mathematics.

Research Question Three: To what extent do teachers' apply blended teaching method in teaching and learning of mathematics?

Table 3: Mean and standard deviation of responses on teachers' application of blended teaching method for effective teaching and learning of mathematics

S/N	Item Statement	N	Mean	SD	Decision
1.	I combine face-to-face instruction with digital activities	200	2.43	.51	LE
2.	I use instructional video packages in teaching mathematics	200	1.46	.52	VLE
3.	I use digital tools to explain some concept in mathematics	200	1.75	.75	LE
4.	I provide students with online mathematics learning materials through their smart phones	200	2.24	.75	LE
5.	I encourage students to use mobile devices to practice maths problems	200	1.88	.78	LE
6.	I use online group charts for mathematical instructions	200	2.68	.84	HE
7.	I guide students on how to use mobile apps for learning maths	200	1.81	.39	LE
8.	I assign mathematics exercises that students complete using mobile devices	200	1.76	.97	LE
9.	I design mathematics lesson plans that include blended teaching	200	1.88	.78	LE
10.	I use blended teaching to improve difficult maths topics	200	2.00	.61	LE
Cluster Mean		200	1.99	.18	PA

key: Very Low Extent (VLE) = 1.00-1.49, Low Extent (LE)= 1.50-2.49, High Extent (HE) = 2.50-3.49 and Very High Extent (VHE) = 3.50 and above

The results shown in Table 3 show how much teachers are using blended learning techniques to improve mathematics instruction. The cluster mean value of 1.99, which is within the actual range of 1.50 to 2.49, indicates that teachers are not

using blended learning strategies to effectively teach mathematics. The cluster standard deviation varied from 0.39 to 0.97, indicating a diversity in the responses provided by the participants.

Research Question Four: What are the mean rating response of teachers' applications of blended teaching method for teaching and learning of mathematics based on gender?

Table 4: Gender difference on the mean rating scores of teachers' applications of blended teaching method for effective teaching and learning of mathematics

Gender of Teachers	N	Mean	Std. Deviation
Male	158	1.9823	.30941
Female	42	2.0071	.31031

Table 4 presented above illustrates the average ratings of teachers' implementation of

blended teaching methods for the effective instruction and learning of mathematics, categorized by gender.

According to the data, male teachers received a mean rating of 1.9823, which is marginally lower than the female teachers' mean rating of 2.0071. Nevertheless, both ratings fall short of the decision mean of 2.50.

This indicates that the utilization of blended teaching methods by both male and female mathematics educators is limited.

Hypotheses

HO₁: There is no significant difference in the mean response of male and female teachers on awareness of blended teaching method for teaching and learning of mathematics.

Table 5: t-test summary table on the mean ratings of teachers' awareness of blended teaching method for teaching and learning of mathematics

Gender of Teachers	N	Mean	df	t-cal	Sig. (2-tailed)	Decision
Male	158	2.3791	198	3.968	.000	Sig.
Female	42	2.1476				

Table 5 above shows that the computed t-value of 3.968 corresponds to a probability value of 0.000, which is below the alpha significance level of 0.05. The null hypothesis, which states that there is no appreciable difference between the mean responses of male and female teachers regarding their awareness

of blended learning approaches for teaching mathematics, was therefore rejected. This implies that male and female math teachers have very different levels of awareness regarding blended learning strategies for teaching and learning mathematics.

HO₂: There is no significant difference in the mean response of male and female teachers on applications of blended teaching method for effective teaching and learning of mathematics.

Table 6: t-test summary table on the mean ratings of teachers' application of blended teaching method for teaching and learning of mathematics

Gender of Teachers	N	Mean	df	t-cal	Sig. (2-tailed)	Decision
Male	158	1.9823	198	-0.463	.644	Not Sig.
Female	42	2.0071				

The calculated t-value of -0.463, as shown in Table 6 above, corresponds to a probability value of 0.644, which is greater than the predefined alpha level of significance set at 0.05. As a result, the null hypothesis which holds that the mean responses of male and female teachers about the use of blended teaching methods in mathematics education do not differ significantly was not rejected. Therefore, it can be said that when it comes to using blended learning strategies for successful math instruction, there is no discernible difference between male and female educators.

Discussion of Findings

The results of this study will be discussed under the following subheadings.

Teachers' Awareness of Blended Teaching and Students' Achievement in Mathematics

The results of this study show that teachers are not well-versed in the blended learning approach for teaching and learning mathematics. Interestingly, male math teachers seem to have a greater awareness of this. According to the data, teachers who have little to no knowledge of blended learning are less likely to successfully incorporate it into their math lessons.

These findings align with the research conducted by Ikponmwosa and Enoghayin (2025), which revealed that mathematics teachers exhibited a similar lack of awareness regarding specific blended teaching tools, including online collaborative platforms and educational games. Furthermore, the results of this study are consistent with those reported by Nwankwo, Ugwu, and Ngwu (2020), who found that science teachers in Nigeria also demonstrated a low level of awareness concerning blended teaching methodologies. This indicated that the problem of limited awareness is longstanding and cut across all science subjects. However, the finding of this study disagreed with the results of the study by Egara and Mosimege (2024), who stated that mathematics teachers demonstrated basic awareness and positive perceptions of digital tools, but lacked the pedagogical knowledge required for effective blended teaching integration. The contradiction in the results of the previous and present studies may be due to the extent of teachers' exposure to mobile devices.

Teachers' Application of Blended Teaching and Students' Achievement in Mathematics

The findings of this study indicated that teachers exhibited a low level of implementation of

blended teaching methods in the instruction and learning of mathematics. Furthermore, the results demonstrated that there was no significant difference in the degree of application of blended teaching methods for effective teaching and learning between male and female mathematics educators. This study's findings align with the research conducted by Olanrewaju, Moshood, and Awoyemi (2025), which revealed that despite a moderate level of awareness, only 10% of pre-service mathematics teachers had utilized digital tools in their instructional practices. This highlights a considerable disparity between theoretical knowledge and practical application. Similarly, Ikponmwosa and Enoghayin (2025) reported a low level of mathematics teachers' use of blended learning tools, noting very limited integration of online collaborative platforms within the classroom. Conversely, experimental studies by Bello, Moyi, and Ginga (2025) indicated that students who were taught using blended instructional strategies achieved significantly better outcomes and experienced fewer misconceptions in mathematics. This underscores the importance of effective implementation of blended teaching methods by teachers in secondary schools across Nigeria.

Conclusion

Based on the results of the study regarding teachers' awareness and implementation of blended teaching methods for effective mathematics instruction, it can be concluded that mathematics educators have a limited understanding of this approach, resulting in a low level of application. Therefore, for this method of teaching to be implemented effectively there is an urgent need for teachers, most especially mathematics teachers to exercise high level of awareness and application of this method of teaching in their classroom practices to ensure that students' interest in this subject and their achievement are enhanced in Kogi-East, Nigeria.

Recommendations

The following recommendations have been put forth in light of the study's findings.

1. Secondary schools administrators in collaboration with the state ministry of education should organize seminars, workshops or conferences to expose mathematics teachers to blended teaching method and its applications for effective teaching and learning
2. Secondary schools teachers most especially, the senior secondary arms should develop themselves through training and re-training

in order to acquire adequate knowledge of blended teaching method. Efforts through this will create opportunity to be exposed to its instructional packages and applications in effective teaching and learning.

3. Federal or State Government, Non-Governmental organizations and stakeholders in education in collaborative with schools' administrators should organized an online science teachers exhibition that will give room for mathematics teachers to display their creativity in teaching some topics through blended teaching methods.

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