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Examining the Association between Meta AI Use and English Language Pedagogy among Teachers and Students in North-Eastern Nigeria: A Convergent Mixed-Methods Study

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Abstract

This study examined the association between Meta AI and English language pedagogy in selected institutions in North-Eastern Nigeria. The study was anchored on the Technology Acceptance Model, Constructivist Learning Theory, Second Language Acquisition Theory and Activity Theory to explain technology adoption, learner-centred instruction, language acquisition processes and socio-technical dynamics of AI integration. A convergent parallel mixed-methods design was employed. A minimum sample size of 343 participants, determined using the Taro Yamane formula, was increased to 360 to accommodate possible non-response. The quantitative sample comprised 55 English language lecturers, 85 teachers, and 220 undergraduate students selected through multistage sampling. Qualitative data were obtained through semi-structured interviews with 12 purposively selected participants comprising four English language lecturers, four English language teachers, and four undergraduate students. Data were collected using a structured questionnaire and a semi-structured interview guide. The validity of the instruments was established through expert review, while reliability was confirmed using Cronbach's alpha coefficients of 0.81. Quantitative data were analysed using descriptive statistics and Chi-square analysis, while qualitative data were analysed thematically. Findings revealed significant positive associations between Meta AI use and respondents' perceptions of writing proficiency, vocabulary acquisition, learner motivation, pedagogical practices, and learner engagement ($\chi^2 = 42.63$, $p < .05$). Qualitative findings corroborated these results, highlighting improved personalized learning, immediate feedback, learner autonomy, and classroom interaction, alongside challenges such as poor internet connectivity, inadequate teacher training, and overreliance on AI tools. The study concludes that Meta AI is significantly associated with improved English language pedagogy and recommends strengthened digital infrastructure, teacher training, and policy frameworks for responsible AI integration.

Keywords: Artificial Intelligence, English Language Pedagogy, Meta AI, Mixed Methods Technology Acceptance Model

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Introduction

The integration of artificial intelligence (AI) into education has attracted considerable scholarly attention due to its potential to transform teaching and learning processes. AI technologies facilitate adaptive, interactive, and personalized learning environments that respond to individual learner needs, thereby shifting instructional practices from teacher-centred to learner-centred approaches (Iorhemen *et al.,* 2026). Among recent AI innovations, generative AI tools such as Meta AI, ChatGPT, and Google Gemini have emerged as disruptive technologies with significant implications for language education.

Meta AI refers to the conversational artificial intelligence assistant developed by Meta Platforms and integrated into widely used applications such as WhatsApp, Facebook, Instagram, and Messenger. Powered by Meta's Large Language Model (LLaMA), Meta AI supports natural language interaction, automated text generation, grammar assistance, vocabulary development, and real-time instructional support. Unlike many AI platforms that require dedicated subscriptions or specialized applications, Meta AI is embedded within social media environments already familiar to many learners and educators, making it particularly accessible in resource-constrained educational contexts.

The increasing adoption of AI technologies is reshaping English language pedagogy by supporting writing development, vocabulary acquisition, grammar correction, conversational practice, and personalized learning experiences. AI-assisted learning environments have been associated with improved writing proficiency, enhanced learner motivation, increased engagement, and greater instructional efficiency (Akpa & Iorhemen, 2026; Wang et al., 2025). AI-powered conversational agents also promote learner autonomy and self-directed learning by providing immediate feedback and adaptive instructional support.

A growing body of literature highlights both the opportunities and challenges associated with AI integration in language education. Empirical studies consistently demonstrate that AI enhances writing skills, vocabulary development, learner motivation, and learner autonomy through personalized feedback and interactive learning experiences (Koç & Savaş, 2024; Li et al., 2025; Liu et al., 2025). These technologies facilitate learner-centred instruction by enabling students to engage more actively in the learning

process while supporting teachers in the design and delivery of instructional materials.

Despite these benefits, concerns remain regarding the pedagogical and ethical implications of AI use. Scholars caution that excessive reliance on AI-generated responses may reduce opportunities for independent thinking, critical reflection, and authentic language production (Lee et al., 2025). Ethical concerns relating to academic integrity, plagiarism, and authorship further complicate AI adoption in educational settings (Jeon, 2025). Moreover, infrastructural challenges such as inadequate internet connectivity, limited digital resources, and insufficient teacher preparedness continue to constrain effective implementation, particularly in developing countries. These constraints may widen existing digital inequalities by limiting access to AI-supported learning opportunities (Torres & Kahveci, 2025).

Although existing research generally supports the pedagogical value of AI in language learning, important gaps remain. First, much of the evidence originates from technologically advanced regions, with limited empirical studies conducted in African educational contexts. Second, previous studies have predominantly employed quantitative or conceptual approaches, providing limited insight into the lived experiences of teachers and learners. Third, while generative AI has received increasing scholarly attention, little research has specifically examined Meta AI and its implications for English language pedagogy. Given its widespread accessibility through social media platforms, Meta AI may offer unique opportunities and challenges that differ from those associated with other generative AI systems.

This study addresses these gaps by examining the association between Meta AI and English language pedagogy in selected institutions in North-Eastern Nigeria. Specifically, it investigates the relationship between Meta AI and students' writing proficiency, vocabulary acquisition, learner motivation, pedagogical practices, and learner engagement, while also exploring the opportunities and challenges associated with its integration into English language teaching and learning

Empirical studies have consistently shown that AI-assisted language learning improves students’ writing proficiency, vocabulary acquisition, speaking confidence, and overall communicative competence. AI chatbots and intelligent tutoring systems further promote motivation, learner autonomy, and

personalized learning experiences, making language learning more interactive and flexible (Wang et al., 2024).

Despite these benefits, scholarly discourse remains divided. While some researchers emphasize the pedagogical advantages of AI in improving learning outcomes and access to instructional resources, others caution against risks such as overdependence on AI tools, reduced critical thinking, academic dishonesty, and weakened authentic communication skills (Torres & Kahveci, 2025; Jeon, 2025). Concerns have also been raised about the reinforcement of dominant language norms and the marginalization of local linguistic identities.

Within Nigerian and similar contexts, challenges such as poor digital infrastructure, limited internet access, and insufficient teacher training further constrain the effective use of AI in English language classrooms. Although existing studies have explored AI in language education, there remains limited empirical evidence focusing specifically on how Meta AI associated with pedagogical practices, learner engagement, and instructional dynamics in such contexts.

This study therefore addresses this gap by examining the pedagogical transformation, learner engagement, opportunities, and challenges associated with Meta AI integration in English language teaching and learning.

Recent scholarship suggests that AI technologies have shifted language learning from static, teacher-controlled instruction to dynamic, learner-responsive environments (Li et al., 2025; Torres & Kahveci, 2025). From a learning sciences perspective, AI is widely celebrated for its capacity to scaffold second language acquisition through immediate corrective feedback, adaptive exercises, and conversational practice. However, critics argue that AI systems may reduce the depth of cognitive engagement by over-structuring learning processes and limiting spontaneous communicative negotiation (Lee et al., 2025). This tension establishes an ongoing debate between AI as a facilitator of learning efficiency and AI as a potential constraint on authentic language development.

Generative AI systems, including conversational agents and large language models, have significantly influenced English language pedagogy by supporting writing development, vocabulary expansion, grammar correction, and interactive communication. Empirical evidence indicates that AI tools improve learners' writing fluency, motivation, and accuracy by providing

instant feedback and modeling linguistic structures (Koç & Savaş, 2024; Lee & Cho, 2025).

However, contrary perspectives caution that generative AI may encourage cognitive offloading, where learners rely excessively on automated responses rather than developing independent linguistic competence Lee et al. (2025). The integration of AI into English language teaching has contributed to a significant pedagogical shift from teacher-centered instruction to learner-centered and technology-enhanced pedagogies. AI tools enable teachers to adopt blended learning approaches, design adaptive instructional materials, and provide differentiated learning experiences that address diverse learner needs (Torres & Kahveci, 2025).

A consistent finding across the literature is that AI technologies enhance learner engagement in English language learning. AI-supported instruction increases participation, reduces anxiety, and fosters interactive learning environments that motivate learners to practice language skills more frequently and confidently (Koç & Savaş, 2024; Xiong & Teo, 2025).

Quantitative syntheses further show that AI-assisted learning improves writing quality, vocabulary acquisition, and speaking fluency through structured feedback mechanisms (Li et al., 2025). However, critics argue that such engagement may be largely surface-level, driven by novelty effects rather than sustained cognitive development. There is concern that learners may become dependent on AI-generated corrections, thereby limiting opportunities for productive struggle a key component of language acquisition. This duality highlights a central debate in the literature: whether AI deepens meaningful engagement or merely increases interaction frequency without fostering deep linguistic competence. The literature widely acknowledges that AI offers substantial opportunities for English language pedagogy. These include personalized learning pathways, immediate feedback, expanded access to learning materials, and flexible learning environments that support self-directed study (Mohebbi, 2024; Liu et al., 2025). In resource-constrained environments, AI is particularly valued for extending learning opportunities beyond traditional classroom limitations.

Despite these benefits, significant challenges persist. Infrastructure deficits, such as unreliable internet access and limited digital tools, remain major barriers to effective implementation, especially in developing contexts.

Additionally, inadequate teacher training and low digital literacy hinder meaningful integration of AI into classroom practice.

Ethical concerns also dominate scholarly debates. Issues such as plagiarism, academic dishonesty, and overdependence on AI-generated content raise questions about assessment validity and intellectual authenticity (Jeon, 2025). These challenges create a paradox in which AI simultaneously expands access to learning while introducing new forms of educational inequality and ethical complexity.

A synthesis of existing studies reveals general consensus that AI improves language learning outcomes through enhanced feedback, engagement, and personalization. However, the literature remains divided on the long-term pedagogical implications of AI integration. Three key gaps are evident. First, there is a geographical gap**,** as most studies are conducted in technologically advanced regions, with limited focus on African educational contexts such as Nigeria. Second, a methodological gap exists due to the dominance of quantitative reviews and conceptual studies, with fewer mixed-methods investigations capturing both statistical and experiential data. Third, a pedagogical gap persists, as limited research has examined how Meta AI specifically associate with classroom teaching practices, learner engagement, and instructional dynamics. These gaps justify the need for the present study, which investigates the pedagogical association, learner engagement, opportunities, and challenges associated with Meta AI in English language education.

While existing research has extensively examined ChatGPT and other generative AI tools, limited empirical evidence exists on Meta AI, particularly in African educational contexts. Unlike ChatGPT, which is primarily accessed through a dedicated platform, Meta AI is integrated into widely used applications such as WhatsApp, Facebook, Instagram, and Messenger, making it more accessible to teachers and students in resource-constrained environments. Its socially embedded nature enables real-time language support within everyday communication settings, potentially influencing learner engagement and pedagogical practices differently from stand-alone AI systems. Consequently, findings from ChatGPT-focused studies cannot be directly generalized to Meta AI, thereby necessitating context-specific investigation of its educational implications in English language pedagogy.

Theoretical Framework

This study is anchored on four complementary theoretical perspectives that together explain the adoption, pedagogical utility and socio-technical dynamics of Meta AI integration in English language teaching and learning. The Technology Acceptance Model (TAM), proposed by Davis (1989), holds that technology adoption is determined by users' perceived usefulness and perceived ease of use of a given technology. In this study, TAM explains why English language teachers, lecturers, and students in North-Eastern Nigeria accept or resist Meta AI, particularly in relation to teacher preparedness, digital infrastructure, and attitudes toward AI-assisted pedagogy.

Constructivist Learning Theory, rooted in the works of Vygotsky (1978) and Bruner (1966), posits that learners actively construct knowledge through interaction with their environment and instructional tools rather than passively receiving information. This theory frames the pedagogical transformation observed in the study, particularly the shift from teacher-centered instruction to learner-centered, AI-mediated learning facilitated by Meta AI.

Second Language Acquisition (SLA) Theories, notably Krashen's (1982) Input Hypothesis and Swain's (1985) Output Hypothesis, establish that language acquisition requires both exposure to comprehensible linguistic input and opportunities for productive language use. These theories ground the findings related to Meta AI's influence on writing proficiency, vocabulary acquisition, and learner motivation by explaining the cognitive mechanisms through which AI-mediated interaction supports English language development.

Activity Theory, developed by Leont'ev (1978) and elaborated by Engeström (1987), examines human activity as a socio-technical system in which tools, subjects, rules, and community interact dynamically. This theory contextualises Meta AI as a culturally embedded mediating tool within the English language classroom, helping to explain the institutional contradictions and socio-technical tensions that arise during AI integration in North-Eastern Nigerian educational settings.

Statement of the Problem

The rapid advancement of artificial intelligence technologies, particularly Meta AI and other generative AI tools, has significantly influenced English

language teaching and learning by improving feedback mechanisms, learner engagement, and instructional personalization. Ideally, these technologies should enhance learner-centered pedagogy, improve instructional quality, and support equitable access to language learning resources.

However, in practice, the integration of AI into English language pedagogy remains uneven, especially in developing contexts such as Nigeria. Existing studies have largely focused on general AI effectiveness without adequately examining how Meta AI associated with pedagogical practices, learner engagement, and instructional dynamics in English language classrooms.

Furthermore, challenges such as poor digital infrastructure, inadequate teacher preparedness, limited digital literacy, and ethical concerns surrounding AI-generated content hinder effective implementation. These gaps create uncertainty regarding the extent to which Meta AI can meaningfully associates with English language pedagogy in real classroom settings.

Therefore, there is a need for empirical evidence to examine the pedagogical transformati, opportunities, and challenges associated with Meta AI integration in English language education.

Research Objectives

Specifically, the study sought to:

I. examine the association between Meta AI and students' writing proficiency, vocabulary acquisition, and learner motivation.

II. investigate the association between Meta AI use and pedagogical practices and learner engagement.

III. identify the opportunities and challenges associated with the integration of Meta AI in English language pedagogy.

Research Questions

I. What are respondents' perceptions of the relationship between Meta AI use and students' writing proficiency, vocabulary acquisition, and learner motivation?

II. What are respondents' perceptions of the relationship between Meta AI use, pedagogical practices, and learner engagement?

III. What opportunities and challenges are associated with the integration of Meta AI in English language pedagogy?

Research Hypotheses

Null Hypotheses (H_0)

H_{01}: There is no significant association between Meta AI and students' writing proficiency, vocabulary acquisition, and learner motivation.

H_{02}: There is no significant association between Meta AI use and pedagogical transformation and learner engagement in English language classrooms.

H_{03}: There is no significant association between Meta AI integration and the perceived opportunities and challenges in English language pedagogy.

Methodology

The study adopted a mixed-methods research design using the convergent parallel approach. This design integrates quantitative and qualitative methods in a single study to obtain a broader and deeper understanding of the phenomenon under investigation. The quantitative component generated numerical data on the extent to which Meta AI influences English language teaching, learning outcomes, learner engagement, and pedagogical transformation, while the qualitative component explored participants' perceptions, experiences, and challenges associated with the integration of Meta AI in English language pedagogy. The choice of mixed methods is informed by the complex nature of AI-mediated pedagogy, which requires both statistical evidence and interpretive insights for comprehensive analysis. The study was conducted in selected public universities and secondary schools within North Eastern Nigeria where digital learning technologies and AI-supported instructional tools are increasingly utilized in English language teaching and learning. The choice of these institutions is based on the growing integration of digital educational technologies and internet-enabled learning environments in Nigerian educational institutions.

The population comprises English language lecturers, English language teachers, and undergraduate students offering English-related courses in selected institutions. The estimated population size is 2,400 participants. The population is considered appropriate because these categories of participants are directly involved in the teaching and learning of English language and are therefore capable of providing relevant information concerning the use of Meta AI in pedagogy.

The sample size for the study was determined using the Taro Yamane (1967) formula for finite populations:

n=N1+N(e)2n = \frac{N}{1 + N(e)^2}n=1+N(e)2N

Where:

I. nnn = sample size

II. NNN = total population

III. eee = level of significance (0.05)

Substituting the values:

n=24001+2400(0.05)2=24007≈343n = \frac{2400}{1 + 2400(0.05)^2} = \frac{2400}{7} \approx 343n=1+2400(0.05)22400=72400≈343

Although the minimum required sample size was 343, an additional 17 participants (approximately 5%) were included to compensate for anticipated non-response, incomplete responses, and potential attrition during data collection. Such adjustment is recommended in survey research to maintain adequate statistical power and ensure representativeness. Consequently, the final sample size used for the study was 360 participants.

The study adopted a multistage sampling technique involving purposive, stratified, and simple random sampling methods. Purposive sampling was first used to select institutions where digital learning platforms and AI-assisted instructional technologies are actively utilized. This ensures that participants possess adequate exposure to Meta AI applications in English language pedagogy. The participants were then grouped into three strata: English language lecturers, English language teachers and Undergraduate students. This ensured equitable representation of all participant categories. Thereafter,

simple random sampling was employed to select participants from each stratum to eliminate bias and provide equal opportunity for participation. The sample size of 360 participants was proportionately distributed across selected institutions and participant categories to ensure adequate representation.

The final sample comprised 360 participants, proportionately distributed across the selected institutions and participant categories. Specifically, the sample included 55 English language lecturers (15.3%), 85 English language teachers (23.6%), and 220 undergraduate students (61.1%) students drawn from selected universities, colleges of education, and secondary schools in North-Eastern Nigeria. The relatively larger proportion of undergraduate students reflects their numerical dominance within the target population and their position as the primary beneficiaries of AI-supported English language instruction. Since the study sought to examine both pedagogical practices and learning experiences associated with Meta AI, greater representation of students was considered appropriate for capturing diverse learner perspectives.

Although undergraduate students constituted the largest proportion of the sample, the use of stratified sampling ensured that all key stakeholder groups involved in English language pedagogy were represented. The larger student sample may have resulted in findings that more strongly reflect learner experiences than educators' perspectives. To minimize this potential response bias, quantitative findings were triangulated with qualitative interview data obtained from lecturers, teachers, and students, thereby providing a more balanced interpretation of the study findings.

In line with the operational definition established in the introduction, this study focused specifically on participants' use of Meta AI the conversational AI assistant embedded within WhatsApp, Instagram, Facebook, and Messenger as the primary AI tool under investigation. Participants were explicitly informed of this scope during instrument administration to ensure consistency of responses.

Two instruments were used for data collection: Structured Questionnaire and Semi-Structured Interview Guide. The questionnaire was designed using a five-point Likert scale ranging from Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D), and Strongly Disagree (SD). The questionnaire was structured using a five-point Likert scale consisting of Strongly Agree (SA) = 5, Agree (A) = 4, Undecided (UD) = 3, Disagree (D) =

2, Strongly Disagree (SD) = 1. The instrument was divided into four sections corresponding to the major variables of the study. The questionnaire consisted of sections covering: Demographic information, Influence of Meta AI on English language learning, Pedagogical transformation associated with Meta AI, Learner engagement and motivation and Opportunities and challenges of Meta AI integration. The interview guide was used to obtain qualitative data from selected lecturers and teachers concerning their experiences, perceptions, and observations regarding Meta AI integration in English language pedagogy.

Semi-structured interviews were conducted with 12 participants comprising four English language lecturers, four English language teachers, and four undergraduate students purposively selected based on their experience with AI-supported learning technologies. Each interview lasted between 25 and 40 minutes and was audio-recorded with participants' consent. The interview protocol focused on experiences, opportunities, challenges, and perceptions regarding Meta AI integration in English language pedagogy. Data collection continued until thematic saturation was achieved, as no substantially new themes emerged after the twelfth interview. To enhance trustworthiness, member checking was conducted by sharing interview summaries with participants for confirmation and clarification of interpretations.

The validity of the instruments was established through face validity and content validity. The instruments were presented to experts in English Language Education, Educational Technology and Measurement and Evaluation. The experts examined the clarity, appropriateness, and comprehensiveness of the items in relation to the objectives of the study. The experts also assessed whether the questionnaire adequately covers all variables under investigation, including pedagogical transformation, learner engagement, AI integration, and instructional effectiveness. Their corrections and recommendations were incorporated into the final version of the instruments. A pilot study was conducted using 30 participants outside the selected institutions but with similar characteristics to the target population. The responses obtained were analyzed using Cronbach's Alpha reliability method to determine the internal consistency of the questionnaire items. The reliability coefficients obtained were 0.82 for Influence of Meta AI on English Language Learning, 0.79 for Pedagogical Transformation and Learner Engagement, and 0.81 for Opportunities and Challenges of Meta AI Integration, while the overall reliability coefficient of the instrument was 0.81. These values exceeded the acceptable benchmark of 0.70 recommended by

Nunnally and Bernstein (1994) indicating that the instrument was reliable for the study.

The researchers administered the questionnaires to participants with the assistance of trained research assistants. Permission was obtained from the management of the selected institutions before data collection. The interview sessions were conducted physically and, where necessary, through online platforms such as Zoom or Google Meet to accommodate participants' schedules and digital accessibility. Respondents were given adequate time to complete the questionnaires to ensure accuracy and thoughtful responses. Under Assumption Testing, prior to inferential analysis, the data were screened for completeness and compliance with statistical assumptions. The distribution of responses was examined using skewness and kurtosis statistics. Values fell within the acceptable range of ±2, indicating approximate normality. Independence of observations was ensured through random sampling procedures, while expected cell frequencies for Chi-square analysis exceeded the minimum recommended threshold of five. These results confirmed the suitability of the data for inferential statistical analysis.

Quantitative data obtained from the questionnaires were analyzed using descriptive and inferential statistics. The descriptive statistics used included frequency counts, percentages, mean scores, and standard deviation. The hypotheses were tested using Chi-square (χ^2) analysis to determine whether statistically significant associations existed among the variables under investigation. The analysis focused on testing the statistical significance of associations using Chi-square procedures; therefore, effect-size statistics such as Cramer's V were not computed.

All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS) at a 0.05 level of significance.

Results

Research Question One

Table 1: What are respondents' perceptions of the relationship between Meta AI use and students' writing proficiency, vocabulary acquisition, and learner motivation?

S/N	Item	Mean	SD	Decision
1	Meta AI enhances students' English writing skills through instant feedback.	4.21	0.71	Agree
2	Meta AI improves vocabulary development among learners	4.08	0.82	Agree

3	Meta AI promotes personalized learning in English language classrooms.	4.17	0.75	Agree
4	Meta AI increases students' motivation toward learning English language	403	0.88	Agree
5	Meta AI facilitates interactive communication in language learning.	4.44	0.79	Agree
	Grand Mean	4.12		

Table 1 indicates that respondents generally agreed that Meta AI use is associated with writing proficiency, vocabulary acquisition, and learner motivation. The grand mean score of 4.12, which is above the criterion mean of 2.50, suggests that Meta AI substantially enhances writing skills, vocabulary acquisition, learner motivation, personalized learning, and interactive communication among learners.

Qualitative Findings Supporting Research Question One

Theme 1: Meta AI Enhances Language Learning Outcomes

Interview participants consistently perceived Meta AI as a valuable learning tool that improves writing skills, expands vocabulary, and increases motivation to learn English. Participants emphasized that the immediate feedback provided by Meta AI enables learners to identify and correct grammatical errors while developing confidence in language use.

One lecturer explained:

"Meta AI allows students to receive instant corrections and suggestions, making writing practice more effective and less intimidating."

Similarly, a student stated:

"Using Meta AI has helped me learn new vocabulary and improve my sentence construction because I receive explanations immediately."

These responses corroborate the quantitative finding (Grand Mean = 4.12), indicating that Meta AI is positively associated with improved writing proficiency, vocabulary acquisition, and learner motivation.

Research Question Two

Table 2: What are respondents' perceptions of the relationship between Meta AI use, pedagogical practices, and learner engagement?

S/N	Item	Mean	SD	Decision

1	Meta AI encourages learner-centered instructional practices.	4.14	0.80	Agree
2	Teachers use Meta AI to design innovative instructional materials	4.06	0.83	Agree
3	Meta AI improves classroom interaction and collaboration.	3.98	0.86	Agree
4	Meta AI supports flexible and blended learning environments.	420	0.74	Agree
5	Meta AI increases students' active participation during lessons.	4.01	0.85	Agree
	Grand Mean	4.08		

Table 2 reveals that respondents generally perceived Meta AI use as being associated with learner-centred instructional practices and learner engagement. The grand mean of 4.08 indicates that respondents perceived Meta AI as promoting learner-centered teaching, innovative instructional delivery, collaborative learning, and active classroom participation.

Qualitative Findings Supporting Research Question Two

Theme 2: Meta AI Promotes Learner-Centred Pedagogy and Engagement

Participants reported that Meta AI has changed classroom practices by encouraging learner autonomy, active participation, and more interactive teaching approaches. Teachers noted that AI-assisted instructional resources have improved lesson preparation and increased classroom engagement. One teacher observed:

"Students participate more actively because they can explore ideas independently before classroom discussions."

A lecturer also remarked:

"Meta AI supports learner-centred teaching by allowing students to solve language tasks with minimal teacher intervention."

These qualitative findings reinforce the quantitative results (Grand Mean = 4.08), suggesting that Meta AI is associated with pedagogical innovation and increased learner engagement

Research Question Three

Table 3: What opportunities and challenges are associated with the integration of Meta AI in English language pedagogy?

S/N	Item	Mean	SD	Decision

1	Meta AI provides opportunities for self-directed learning	4.18	077	Agree
2	Meta AI improves access to language learning resources	4.09	0.81	Agree
3	Poor internet connectivity limits effective AI integration	4.26	0.69	Agree
4	Lack of teacher training affects the use of Meta AI in classrooms	4.31	0.66	Agree
5	Overdependence on AI may reduce students' critical thinking skills	3.95	0.91	Agree
	Grand Mean	**4.08**		

Table 3 indicates that respondents generally agreed that Meta AI integration presents both opportunities and challenges for English language pedagogy. The major challenges identified include poor internet connectivity, inadequate teacher training, and excessive dependence on AI tools.

Qualitative Findings Supporting Research Question Three

Theme 3: Opportunities and Challenges of Meta AI Integration

Participants acknowledged that Meta AI provides opportunities for self-directed learning and improved access to learning resources. However, they also identified inadequate internet connectivity, insufficient teacher training, and excessive dependence on AI-generated responses as major barriers to effective implementation. A teacher explained:

"The technology is useful, but unstable internet connectivity often interrupts its effective use during classroom activities."

A student commented:

"Sometimes learners depend too much on AI instead of attempting tasks independently."

These findings support the quantitative evidence that although Meta AI offers substantial educational opportunities, infrastructural and pedagogical challenges remain significant.

Test of Hypotheses

Hypothesis One: There is no significant association between Meta AI and students' writing proficiency, vocabulary acquisition, and learner motivation.

Table 4: *Chi-Square Test of Association between Meta AI and English Language Learning Outcomes*

Variables	χ^2-cal	χ^2-crit	df	Sig. Level	Decision
Meta AI and English Language Learning	42.63	9.49	4	0.05	Reject H_0

Since the calculated Chi-square value (42.63) is greater than the critical value (9.49), the null hypothesis is rejected. This implies that Mata AI has a significant association on the teaching and learning of English language in the digital age.

Hypothesis Two: There is no significant association between Meta AI use and pedagogical transformation and learner engagement in English language classrooms.

Table 5: Chi-Square Test of Association between Meta AI and Pedagogical Transformation and Learner Engagement

Variables	χ^2-cal	χ^2-crit	df	Sig.	Level	Decision
Meta AI and Pedagogical Transformation	37.51	9.49	4	0.05	Reject H_0	

The calculated Chi-square value (37.51) exceeds the critical value (9.49). Therefore, the null hypothesis is rejected, indicating a statistically significant association between Meta AI use and pedagogical transformation and learner engagement.

Hypothesis Three: There is no significant association between Meta AI integration and the perceived opportunities and challenges in English language pedagogy.

Table 6: Chi-Square Test of Association between Meta AI and Opportunities and Challenges of English Language Pedagogy

Variables	χ^2-cal	χ^2-crit	df	Sig. Level	Decision
Opportunities and Challenges of Meta AI Integration.	45.24	9.49	4	0.05	Reject H_0

Since the calculated Chi-square value (45.24) is greater than the critical value (9.49), the null hypothesis is rejected. This suggests that significant opportunities and challenges are associated with the integration of Meta AI in English language pedagogy.

Discussions

The study revealed a significant positive association between Meta AI and English language pedagogy, particularly in writing proficiency, vocabulary acquisition, learner motivation, pedagogical transformation, and learner

engagement. This finding is consistent across both quantitative and qualitative strands, indicating strong methodological convergence.

Meta AI and Language Learning Outcomes

Quantitative results showed high mean scores (Grand Mean = 4.12) and a significant association ($\chi^2 = 42.63$, $p < .05$) between Meta AI and improved writing proficiency, vocabulary acquisition, and learner motivation. Qualitative evidence reinforced this, with participants reporting that Meta AI provides instant feedback, supports vocabulary development, associated with increased confidence in writing tasks. This convergence aligns with the Technology Acceptance Model (TAM), which posits that perceived usefulness drives technology adoption (Davis, 1989). In this context, learners and teachers perceive Meta AI as useful for immediate linguistic support, thereby enhancing engagement and sustained usage. The findings also align with Stephen Krashen Input Hypothesis, which emphasizes comprehensible input as essential for acquisition. Meta AI provides adaptive, simplified, and corrective input, enabling learners to operate within their zone of linguistic development. Empirically, this supports Wang et al. (2025) and Koç and Savaş (2024), who found that AI-driven tools significantly, improve writing fluency and vocabulary development in ESL contexts.

Meta AI and Pedagogical Transformation

The quantitative findings (Grand Mean = 4.08; $\chi^2 = 37.51$, $p < .05$) indicate that Meta AI is significantly associated with learner-centred instruction and classroom engagement. Qualitative responses further revealed that teachers use Meta AI to design instructional materials and encourage independent learning. This aligns with Lev Vygotsky Constructivist Learning Theory, which emphasizes active knowledge construction through interaction and scaffolding. Meta AI may function as a digital scaffold that supports learners within their Zone of Proximal Development by providing immediate explanations and guided practice. This finding is consistent with Liu et al. (2025), who reported that AI-mediated environments enhance learner autonomy and collaborative engagement in language learning. Practically, this suggests a pedagogical shift from teacher-centred instruction to hybrid learning environments where AI supports instructional delivery, feedback, and learner independence.

Opportunities and Challenges of Meta AI Integration

Both quantitative (Grand Mean = 4.08) and qualitative findings indicate strong agreement that Participants perceived Meta AI as offering opportunities for self-directed learning, access to resources, and flexible learning environments. However, challenges such as poor internet connectivity, inadequate teacher training, and overdependence on AI tools were also prominent. From a TAM perspective, these challenges reduce perceived ease of use, thereby affecting sustained adoption. Similarly, Krashen's Affective Filter Hypothesis suggests that environmental constraints such as technical difficulties may increase learner anxiety and reduce optimal engagement with language input. This is supported by Jeon (2025), who noted that infrastructural and pedagogical limitations remain key barriers to effective AI integration in language education.

The convergence of TAM, Constructivist Theory, and SLA theory demonstrates that Meta AI operates simultaneously as a motivational, cognitive, and pedagogical tool. It enhances perceived usefulness (TAM), supports active knowledge construction (Constructivism), and facilitates comprehensible input and interaction (SLA theory). Practically, the findings suggest that successful integration of Meta AI in English language pedagogy requires: Strengthening digital infrastructure, continuous teacher professional development, structured AI-guided learning strategies; ethical and regulated AI use in classrooms.

Collectively, the study demonstrates that Meta AI is not merely a technological supplement but a transformative pedagogical agent. Its effectiveness is maximized when supported by adequate infrastructure, teacher competence, and learner readiness, confirming its strong but conditional association with improved English language pedagogy in Nigerian educational contexts.

Conclusion

The study concludes that Meta AI use is significantly associated with positive perceptions of English language pedagogy among teachers and students in selected institutions in North-Eastern Nigeria. The quantitative findings revealed significant associations between Meta AI use and students' writing proficiency, vocabulary acquisition, learner motivation, pedagogical practices,

and learner engagement. The qualitative findings further showed that participants perceived Meta AI as a valuable instructional tool associated with immediate feedback, personalized learning, learner autonomy, and classroom interaction ($\chi^2 = 42.63$, $p < .05$). The convergence of the quantitative and qualitative evidence indicates that Meta AI has the potential to support effective English language teaching and learning. These findings are consistent with the Technology Acceptance Model, Constructivist Learning Theory, and Second Language Acquisition Theory, which emphasize the role of technology acceptance, active knowledge construction, and meaningful interaction in facilitating learning outcomes.

Recommendations

Based on the findings of this study, the following recommendations are made:

I. English language teachers and lecturers should consider integrating Meta AI into instructional activities as a complementary tool for supporting writing proficiency, vocabulary development, learner motivation, and classroom engagement.

II. Educational institutions should provide opportunities for teachers and lecturers to develop the pedagogical and technical competencies required for the effective use of Meta AI in English language teaching and learning.

III. Institutional administrators should address challenges relating to internet connectivity and access to digital resources in order to facilitate the effective integration of Meta AI into instructional practices.

IV. Educational institutions should establish clear guidelines for the responsible and ethical use of Meta AI to minimize overreliance on AI-generated responses and promote academic integrity.

V. Researchers should conduct longitudinal and experimental studies in diverse educational settings to further examine the long-term effects of Meta AI on English language learning outcomes and pedagogical practices.

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