

Evaluating the Influence of Meta-AI on Enhancing English Reading Comprehension Proficiency: An Experimental Study within a Social Media Application Framework

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Abstract

The integration of artificial intelligence (AI) with social media platforms is increasingly shaping English language acquisition by transforming user engagement and learning processes. However, there is a notable gap in the literature regarding the specific impact of AI on English reading comprehension among second-year undergraduate students in Karachi's public sector universities. This quasi-experimental study examines the efficacy of Meta-AI integrated with WhatsApp in enhancing reading comprehension. Two intact classes were randomly assigned to experimental (N=20) and control (N=20) groups. The experimental group received AI-mediated instruction via WhatsApp, while the control group followed conventional pedagogical methods. Pre-test and post-test data were collected to assess reading comprehension gains. Statistical analysis demonstrated a significant improvement in the experimental group compared to the control group, indicating that AI-enhanced social media platforms can effectively support English language learning. The findings underscore the potential of AI-driven instructional strategies in fostering reading proficiency, advocating for a paradigm shift towards technology-assisted pedagogical approaches in higher education.

Keywords: Meta-AI, English Reading Comprehension, Social Media Application, Proficiency Enhancement, Undergraduate Students

Introduction

Proficiency in English plays a crucial role in global communication, academia, and business, making it an essential skill for international engagement and success (Crystal, 2013; Alam & Usama, 2023). As the most widely learned second language, English is foundational for learners worldwide, with reading serving as a critical pillar of language development alongside writing, speaking, and listening (Grabe, 2009). Strong reading skills not only support language comprehension but also enhance productive skills like writing and speaking, ultimately fostering higher-order thinking and expression necessary for academic and professional achievement (Cummins, 2000; Alam et al., 2024). Research further underscores the strong correlation between reading proficiency and overall communication competence in both first and second languages (Nation, 2001). The rapid advancement of digital technology—particularly AI integration with

social media has reshaped traditional teaching methods and introduced innovative approaches to language teaching (Chen et al., 2024). AI's ability to personalize instruction and create interactive learning experiences presents unprecedented opportunities for improving English proficiency through digital platforms (Singh & Lee, 2024; Thompson et al., 2024; Usama et al., 2024). Despite the widespread use of social media in daily interactions and its growing presence in education, limited empirical research explores the role of AI-enhanced social media in language acquisition, particularly among non-English major undergraduates in regions like Saudi Arabia. Addressing this research gap, the present study investigates the effectiveness of AI-integrated learning within WhatsApp, a widely used social media application, in improving English reading comprehension among first-year non-English major undergraduates in Saudi Arabia. By examining how AI-driven customization aligns with modern learners' digital habits, this research aims to contribute valuable insights into leveraging technology for enhanced language instruction. Grounded in Stephen Krashen's Input Hypothesis (Krashen, 1982), which emphasizes the role of comprehensible input in language acquisition, this study explores how AI can optimize learning by delivering language input that is both accessible and slightly challenging. An AI-enhanced platform like WhatsApp can tailor reading materials to learners' proficiency levels, ensuring a more adaptive and engaging learning experience. By integrating AI with social media, this approach offers a dynamic and personalized learning environment, potentially accelerating reading comprehension development. Ultimately, this study seeks to advance the conversation on technology-assisted language learning by examining AI's role in refining pedagogical strategies. By focusing on user-friendly tools like WhatsApp that integrate seamlessly into students' daily routines, the research aims to demonstrate how AI can tailor language learning to individual needs, making instruction more effective (Alam et al., 2023). Findings from this study may also inform educational policies and curricular reforms, helping institutions harness technological innovations for more effective language instruction (Harper & Chen, 2023). By shedding light on the educational potential of AI-driven language learning, this research aspires to pave the way for more efficient and accessible learning methodologies suited to the evolving needs of modern learners.

Problem Statement of the Study

Numerous studies have examined the role of AI and social media in enhancing English language proficiency across various educational levels, from primary to higher education. The integration of mobile-based social media applications offers a promising avenue for making language learning more personalized and accessible. However, existing research has predominantly focused on AI and social media as separate entities, with limited exploration of their combined impact on reading comprehension. Specifically, there is a significant gap in understanding how AI, when integrated with WhatsApp, influences reading skill development among English language learners. Given the growing reliance on mobile-based AI applications for education, it is imperative to investigate how these tools facilitate reading comprehension and personalized learning. This study addresses this gap by examining the potential of AI-enhanced WhatsApp as an instructional tool for improving reading proficiency in English language learners.

Purpose of the Research Study

This study aims to investigate the impact of Meta-AI integration within WhatsApp on English reading comprehension among language learners. By analyzing improvements in reading comprehension scores facilitated through AI-driven personalized learning, this research seeks to determine the effectiveness of AI-enhanced social media applications in fostering reading proficiency and supporting skill development in digital learning environments.

Research Objectives

Following are the research questions of the study;

- To examine whether there is a statistically significant difference in reading comprehension outcomes between the experimental and control groups.
- To assess the extent to which the AI-enhanced WhatsApp intervention influences the development of reading skills from the pre-intervention to the post-intervention phase.
- To measure the magnitude of improvement in reading skills from pretest to posttest across both the experimental and control groups.

Research Questions of the study

Following are the research questions of the study;

1. Is there a statistically significant difference in the outcomes across the experimental and control groups?
2. To what extent does the treatment influence reading skills development from the pre-intervention phase to the post-intervention phase?
3. What is the magnitude of gain in reading skills from pretest to posttest across the experimental and control groups?

Significance of the Study

This study is significant because it tries to fill the gap in the literature by exploring the Evaluating the Influence of Meta-AI on Enhancing English Reading Comprehension Proficiency of Pakistani undergraduate ESL university students in the Pakistani setting. The outcomes of the present study be able to be helpful for the Pakistani ESL teachers as they will be able to improve the followings: First of all, it will be beneficial for ESL students in enhancing their reading comprehension. Moreover, it will help English language teachers to guide their students to enhance their reading competency through the utilization of Cooperative learning techniques such as, Jigsaw technique and Think-pair-share technique. Lastly, it will produce good readers in the society who can apply their knowledge for the betterment and progress of the society. This study may prove to be the catalyst for further research in the Pakistani context on this topic.

Literature Review

Followings of the research studies related to the present research study. This is a comprehensive literature review covering AI-enhanced learning, social media's impact on ESL learners, and AI applications in language acquisition.

Meta's AI-Enhanced WhatsApp

Meta-AI WhatsApp represents an advanced integration of artificial intelligence with the widely used messaging platform, WhatsApp, aimed at enriching educational experiences. This AI-driven tool employs sophisticated algorithms to analyze user interactions and deliver personalized English language learning content based on individual proficiency levels. By providing tailored exercises, instant feedback, and corrective guidance, Meta-AI WhatsApp significantly enhances reading skills. Its interactive, conversational format simulates real-world communication, fostering practical language use and continuous engagement. Learners benefit from frequent exposure to contextually relevant content, reinforcing their comprehension abilities. However, the platform's effectiveness depends on factors such as learners' starting proficiency, learning preferences, and adaptability to AI-driven instruction. Additionally, while AI-powered education offers numerous advantages, concerns regarding reduced human interaction, data security, and potential over-reliance on digital learning tools remain critical considerations.

Influence of AI on ESL Learners

Artificial intelligence has significantly transformed English language learning (ELL), yielding positive outcomes across diverse educational settings. Research by Chea and Xiao (2024) indicates that AI tools improve reading comprehension among university students, though concerns about ethical considerations and dependency persist. Wang and Yan (2022) found that integrating AI with the Production-Oriented Approach enhanced reading skills, particularly for learners with higher initial proficiency. Similarly, Zhao and Nazir (2022) emphasized AI's capacity to personalize multimodal reading and writing instruction, adapting content to individual needs. Wang (2024) highlighted AI's role in refining writing assessments for English as a Foreign Language (EFL) learners, ensuring consistency and objectivity. Further, Daweli and Mahyoub (2024) reported positive learner feedback on AI-assisted reading instruction, reinforcing the importance of strategically integrating AI into education. Several studies also demonstrate AI's impact beyond reading comprehension. For instance, Al Mahmud (2023) observed significant improvements in Saudi students' writing proficiency using AI-powered tools like Wordtune. Liu and Reynolds (2024) found that AI-enhanced learning environments bolstered vocabulary retention and reading skills, though they cautioned against potential limitations in fostering independent problem-solving. Large language models, such as ChatGPT, have been particularly effective in supporting academic writing for non-native English-speaking medical students (Li et al., 2024). Meanwhile, Raheem et al. (2023) examined AI tools like Quillbot, Grammarly, and ChatGPT, advocating for ethical considerations in their implementation. Other studies, including Kaharuddin et al. (2024) and Marzuki et al. (2023), explored AI's role in developing writing and speaking proficiency, underscoring students' attitudes as a key factor in determining AI's effectiveness in language learning. AI has also contributed to autonomous learning by offering adaptive feedback mechanisms. Research by Shu and Xu (2022) demonstrated how AI-based English self-learning systems enhance learners' ability to study independently. Additionally, Samala et al. (2024) emphasized the need for balanced AI integration to maximize its benefits while mitigating potential limitations. The transformative potential of AI in higher education is further highlighted by Imran et al. (2024), who stress the importance of overcoming integration challenges to ensure equitable and effective AI adoption in language instruction. Moreover, Kostikova et al. (2024) explored ChatGPT's role in structuring professional English courses, reinforcing the need for human oversight in AI-driven education. These studies collectively indicate that AI has the potential to revolutionize EFL/ESL learning, provided that its integration is carefully managed to balance technological advancements with pedagogical best practices.

Influence of Social Media Applications on ESL Learners

Social media platforms have become integral to English language learning, offering dynamic and interactive environments that support skill development. Muftah (2024) demonstrated that during the COVID-19 pandemic, social media significantly enhanced undergraduate students' reading, writing, listening, and speaking skills, proving its value as an educational tool. Yu et al. (2022) found that Rain Classroom facilitated greater cognitive, behavioral, and social engagement in English learning compared to conventional methods or WeChat. Additionally, Barrot (2021) highlighted the transformative impact of platforms such as Facebook, Skype, and WhatsApp in language education, though challenges such as maintaining academic rigor and managing informal interactions persist. Specific social media platforms have shown varying degrees of effectiveness in language acquisition. For instance, Li (2017) identified YouTube as a powerful tool for engaging learners through accessible and collaborative content. Alharthi et al. (2020) reported that Facebook and Instagram promoted vocabulary development, reinforcing the motivational benefits of incorporating social media into formal education. However, Omoera et al. (2018) noted that while social media fosters engagement, frequent use may introduce informal language into

academic writing, necessitating strategies to mitigate such effects. Shahzadi and Kausar (2020) found that Facebook facilitated real-time peer interaction and feedback, improving English writing skills among Pakistani undergraduate students. Similarly, Dirjal and Ghabanchi (2020) demonstrated that Skype significantly improved Iraqi university students' speaking abilities, underscoring the potential of social media for interactive learning. WhatsApp, in particular, has been widely studied for its impact on English language acquisition. Morsidi et al. (2021) found that WhatsApp encouraged communication skills among Malaysian university students by fostering collaboration and interaction. Behforouz and Al Ghaithi (2024) reported that an interactive WhatsApp bot improved listening skills among Omani EFL learners by extending learning opportunities beyond the classroom. Meanwhile, Mallampalli and Goyal (2021) compared Google Docs/Slides with WhatsApp, concluding that while both facilitated collaborative writing, tool selection should align with specific learning objectives. Alam et al. (2024) observed that Facebook reduced writing errors and enhanced interactive learning for ESL students, though structured support was necessary for optimal results. Additionally, emerging digital tools continue to expand the scope of social media-based language learning. Ilyas et al. (2023) found that Canva-based videos made English learning more engaging for Indonesian junior high school students. Usama et al. (2024) emphasized that Wiki platforms foster collaborative and critical writing skills, while Anwas et al. (2020) noted a positive correlation between frequent exposure to English-language social media content and improved proficiency across all skills among Indonesian high school students. Rusli et al. (2019) highlighted that social media enhanced collaborative learning and self-directed writing among ESL pre-service teachers, though informal language use remained a challenge. The integration of AI and social media into language education presents both opportunities and challenges. AI-powered tools such as Meta-AI WhatsApp, ChatGPT, and Grammarly provide personalized learning experiences, real-time feedback, and adaptive content tailored to individual needs. Meanwhile, social media platforms like WhatsApp, Facebook, and YouTube facilitate interactive and immersive learning environments that enhance English proficiency. However, ethical considerations, data privacy concerns, and the risk of over-reliance on technology necessitate a balanced approach to integrating these tools into pedagogical frameworks. As research continues to explore AI and social media's role in language acquisition, educators must refine their strategies to harness technology's potential while ensuring meaningful and effective learning experiences.

Methodology

According to Schwardt (2007) research methodology is a procedure which shows that how an investigation should be carried out. Further, it includes analysis of procedures, principles and assumptions in a specific way of investigation. As per, Creswell and Tashakkori (2007), Schwardt (2007) point of view, methodology defines and formulates the types of problems which are indispensable to inquire.

Research Design

The term research design is determined as a procedure which is an integral means for research inquiry. Moreover, it involves many ways which are employed in a research work for the analysis and collection of data Schmidt (1999). Research design is the entire design for linking the abstractive research problems to the related and obtainable experimental research. With regard to this study, the researcher has used a quasi-experimental method to collect data. Moreover, quasi-experimental is a data collection method in which pre and post tests, of two different groups such as experimental and traditional group, are conducted before and after the treatment respectively. However, in this study a quasi-experimental data collection method has been employed. With

respect to this, the researcher conducted a pretest of both the groups prior to the treatment and then a post test was conducted after the treatment.

Target Population and Sample

A population is defined as a group of people, objects, or other things. A sample of people who have some common and observable qualities can be taken. A population is also the complete group about which you want to draw conclusions. A sample is a subset of the population from which you will collect data. The sample size is always smaller than the population's total size. A population in research somehow doesn't always refer to humans. It can refer to a collection of items from whatever you are studying, such as objects, events, organizations, countries, species, organisms, and so on.

Target Population

The present research study population has been taken from Computer Science (SC) department from a Public Sector University in Karachi, Pakistan.

Sample of the Study

Various sampling techniques are there in the field of research and the nature of the suitability of the present research study. The purposive sampling technique was employed to select the sample from the target population. Thus, two intact groups of 40 each were selected from a public sector university in Karachi. Purposive sampling, which is also known as subjective, judgmental or selective sampling, is a type of non-random sampling in which the researcher depends mostly on his own judgement when selecting participants of the population to take part in his survey (Schmidt, 1999). With respect to this, the researcher of this study has opted purposive sampling in order to get valid data from the participants.

Data Collection Methods

Multiple research methods have been introduced in the field of research domain, which are used in the research fields. Numerous methods have been employed in order to collect the required data to get the purpose of this study. That is why, the researcher of the present study, has collected the data through Pre-test and post-test.

Data Analysis Techniques

The research has used SPSS (V25) in order to analyze the collected data through independent and dependent sample t-tests.

Results and Findings

TABLE 1

4.1 Analysis of Variance of the Groups

Measures	Experimental Group		Control Group		F	p
	Mean	SD	Mean	SD		
Reading Score	45.94	5.96 3	30.19	3.782	3.028	0.0 01*

A statistical analysis using analysis of variance (ANOVA) was conducted to assess the impact of Meta-AI integration with WhatsApp on reading skills compared to traditional teaching methods. The results revealed a substantial difference between the two instructional approaches. The

experimental group, which received AI-enhanced instruction, achieved a significantly higher mean reading score of 45.94 (SD = 5.963), whereas the control group, following conventional teaching methods, scored notably lower with a mean of 30.19 (SD = 3.782). The analysis yielded an F-statistic of 3.028 and a highly significant p-value of 0.001, confirming that the AI-driven intervention had a meaningful and positive effect on reading proficiency. These findings highlight the efficacy of integrating advanced technological tools into language education, reinforcing the potential of AI to enhance specific linguistic competencies. To further investigate the second research question—how Meta-AI-enhanced instruction via WhatsApp compares to conventional teaching in terms of pre-test and post-test reading performance—the study examined score improvements in both groups (see Table 2). The experimental group demonstrated remarkable progress, increasing from a baseline mean score of 7.00 (SD = 1.038) to a post-test mean of 37.94 (SD = 1.520). This substantial improvement was supported by a t-value of 17.911 and a p-value of less than 0.001, indicating a statistically significant gain in reading proficiency. Conversely, while the control group also showed progress, the improvements were comparatively modest, with scores increasing from 13.34 (SD = 2.109) to 25.85 (SD = 1.673), supported by a t-value of 11.713 at the same significance level. These findings suggest that while both instructional methods contributed to improved reading skills, the integration of Meta-AI with WhatsApp led to significantly greater advancements. The interactive and adaptive nature of AI-enhanced learning likely facilitated a more engaging and personalized educational experience, resulting in higher reading comprehension gains compared to the conventional approach. This study underscores the transformative potential of AI-driven instructional strategies in language learning and provides empirical support for the incorporation of technology into educational frameworks to optimize learning outcomes.

Table 2

4.2 Descriptive Statistics and T-Test Results, Pretest, and Posttest

Groups	Measures	pre-test Mean	SD	post-test Mean	SD	t	p
Control Group	Reading	13.34	2.109	25.85	1.673	11.713	<.001 *
Experimental Group	Reading	7.00	1.038	37.94	1.520	17.911	<.001 *

TABLE 3

4.3 Gains in Reading for Control and Experimental Groups across Tests

Groups	Measures	pre-test Mean	post-test Mean	Gain
Control Group	Reading	13.34	25.85	12.51
Experimental Group	Reading	7.00	37.94	23.94

The analysis addressing the third research question on reading comprehension gains (see Table 3) revealed that the Meta-AI integrated with WhatsApp was significantly more effective than conventional teaching methods in enhancing students' reading skills. The experimental group showed a substantial increase in reading comprehension, with scores rising from a pre-test mean of 7.00 to a post-test mean of 37.94, reflecting a gain of 23.94 points. In contrast, the control group,

which followed traditional instructional methods, demonstrated comparatively modest progress, with scores increasing from a pre-test mean of 13.34 to a post-test mean of 25.85, yielding an overall gain of 12.51 points. The nearly twofold improvement observed in the experimental group underscores the effectiveness of AI-driven, interactive learning environments in fostering reading proficiency, reinforcing the potential of technology-enhanced instruction in language education.

Discussion

The comparative analysis of reading skill development between Meta-AI-integrated WhatsApp instruction and conventional teaching methods revealed a clear advantage in favor of the AI-enhanced approach. The experimental group, which utilized Meta-AI, exhibited significantly greater improvements in reading proficiency than the control group, underscoring the effectiveness of advanced technological tools in fostering student engagement and language acquisition. These findings highlight the potential of AI-driven learning environments to create more interactive and adaptive educational experiences, leading to better learning outcomes compared to traditional methods. The study's results align with Stephen Krashen's Input Hypothesis (1982, 1985), which emphasizes the necessity of comprehensible input in second language acquisition. According to Krashen, language learners benefit most when exposed to input that is slightly above their current proficiency level ($i+1$), allowing for gradual and meaningful skill development. The Meta-AI technology in this study likely provided such an optimized learning experience by delivering content that was both accessible and challenging, closely mirroring Krashen's theoretical model. The AI's ability to personalize instruction and adjust content based on learners' evolving needs contributed to more effective language acquisition, supporting previous research on the role of tailored input in second language development (Gass, 2013; Long, 1996). Additionally, studies by Ellis (2005) and VanPatten (2004) affirm that interactive learning environments, which offer real-time feedback and scaffolding, significantly enhance linguistic competence further reinforcing the practical applicability of Krashen's theory in AI-integrated language learning. Beyond Krashen's framework, this study's findings also resonate with other key linguistic and educational theories. Long's (1996) Interaction Hypothesis, which stresses the importance of meaningful communication in second language acquisition, aligns with the role of Meta-AI in fostering dynamic, real-time interactions that facilitate deeper linguistic engagement. Similarly, Vygotsky's Sociocultural Theory (1978), particularly the Zone of Proximal Development (ZPD), suggests that learners progress more effectively when guided by adaptive support structures. Meta-AI serves as an intelligent scaffold, offering personalized challenges and assistance that optimize reading comprehension. Furthermore, Cognitive Load Theory (Sweller, 2020) helps explain why AI-enhanced instruction is more effective than traditional methods—by structuring information into manageable segments, Meta-AI reduces cognitive overload, allowing learners to process and retain information more efficiently (Paas & Van Merriënboer, 1994). The results of this study also align with a growing body of research highlighting the transformative role of technology in language education. Zou et al. (2023) demonstrated how interactive platforms like WeChat improve speaking skills, while Muftah (2024) showed that social media integration during the COVID-19 pandemic enhanced overall language proficiency, including reading, by fostering engagement and interaction. Alharthi et al. (2020) found that social media platforms contribute to vocabulary development, while Omoera et al. (2018) explored their broader impact on students' writing skills. Additionally, Shahzadi and Kausar (2020) reported significant improvements in English writing through Facebook discussions, and Haidari et al. (2020) observed that platforms like WhatsApp and Wiki promote critical thinking and collaborative learning. Collectively, these studies reinforce the effectiveness of interactive, AI-driven learning environments in language acquisition, further validating this study's conclusions. By integrating contemporary technological tools with established linguistic theories, this research underscores the significant potential of AI-enhanced

learning in improving reading skills. The findings support a shift towards student-centered, adaptive learning methodologies that align with modern educational research, advocating for the strategic incorporation of AI and social media platforms to enhance language education (Anderson, 1987).

Conclusion

This study provides compelling evidence that integrating Meta-AI with WhatsApp significantly enhances reading skills among language learners, offering a more effective alternative to traditional teaching methods. The findings reinforce the value of AI-driven educational tools in fostering learner engagement, improving comprehension, and supporting language acquisition through tailored input and real-time feedback. Grounded in well-established linguistic and pedagogical theories, this research highlights the transformative potential of technology in language education. While the study's findings are promising, certain limitations must be acknowledged. The relatively short intervention period and the specific focus on first-year undergraduate non-English majors may limit the generalizability of the results. Additionally, reliance on a single AI-integrated platform restricts broader applicability, and external factors such as students' prior language exposure and technological proficiency warrant further exploration. Despite these limitations, this study lays the foundation for future research in AI-enhanced language learning. Expanding the scope to diverse learner populations, exploring multiple AI-integrated platforms, and employing longitudinal and qualitative methodologies could provide deeper insights into the long-term efficacy of AI in education. By addressing these areas, future studies can further refine and optimize AI-driven instructional strategies, contributing to the ongoing evolution of technology-enhanced language learning.

Recommendations for Future Research

The relationship of other important variables, such as inferring, activating, monitoring-clarifying, searching-selecting, questioning, summarizing, and visualizing-organizing can be explored in future research. The present study was limited to Government Sector University in Karachi Pakistan, so in future the range of research can be extended to other provinces of Pakistan to assess ESL students' reading comprehension skills. This study can also be done with school and college level students in future.

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