



ChatGPT as a Pedagogical Tool for Developing Literal Reading Comprehension Skills in Pakistani ESL Undergraduates: A Quasi- Experimental Study

Research Article

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Abstract

The integration of artificial intelligence (AI) in education represents a paradigm shift in teaching and learning, offering unprecedented opportunities to enhance instructional effectiveness. This study examined the effect of ChatGPT as a pedagogical tool on undergraduate students' English literal reading comprehension skills, focusing on three sub-skills: contextual meaning, identification of the main idea, and identification of supporting details. A quantitative quasi-experimental design was employed, involving an experimental group and a control group. The sample comprised 78 undergraduate students enrolled in a four-year BS degree program in the Department of Computer Science at a public-sector university in Sindh, Pakistan, where English Comprehension and Composition is taught as a compulsory first-semester course. Participants were selected through purposive sampling. The experimental group ($n = 39$) received ChatGPT-assisted instruction, whereas the control group ($n = 39$) was taught using traditional classroom methods. A reading



comprehension test was administered as both the pretest and posttest. Following a 12-week intervention consisting of one 90-minute instructional session per week, the posttest was administered to both groups. The data were analyzed using IBM SPSS Statistics Version 26 through paired-samples t tests and independent-samples t tests. The findings revealed that the experimental group achieved statistically significant and substantially greater gains in all three reading comprehension sub-skills ($p < .001$) than the control group. The results provide strong empirical evidence of the instructional potential of ChatGPT for improving ESL reading comprehension skills among Pakistani undergraduate students.

Keywords: artificial intelligence, ChatGPT, reading comprehension, literal reading comprehension, contextual meaning, main idea, supporting details, ESL undergraduates, quasi-experimental design

1. Introduction

English holds official status in Pakistan and is widely used in occupational and professional settings. It is regarded as a powerful medium for career development (Aijaz, 2024). According to Shamim (2011), English is extensively used across various spheres of Pakistani society, including education, media, commerce, the military, and civil administration. Given its global importance, the significance and role of English in Pakistan cannot be overlooked (Shamim, 2008). Consequently, English is taught as a compulsory subject in public and private schools, colleges, and universities throughout the country. As the second official language of Pakistan, English plays a central role in education and serves as a compulsory subject across public and private educational institutions (Rahman, 2020).

Despite the high-stakes role of English, many undergraduate students in Pakistan continue to struggle with the fundamental components of literal reading comprehension, including contextual meaning, identification of the main idea, and identification of supporting details. These difficulties arise from several factors, such as limited language proficiency, structural and lexical challenges, insufficient vocabulary, and other linguistic barriers (Ahmed et al., 2024). In addition, inadequate preparation at the secondary school level, predominantly teacher-centered classroom instruction, limited access to authentic English reading materials, and assessment practices that emphasize memorization rather than comprehension further contribute to these challenges (Shamim, 2011).

With the emergence of generative artificial intelligence (AI), particularly ChatGPT, new opportunities have arisen to address these long-standing pedagogical challenges. ChatGPT is a large language model (LLM) developed by OpenAI that enables learners to engage in real-time interactive dialogue with texts by providing contextualized vocabulary explanations, assistance in identifying main ideas, and immediate formative feedback. These features promote individualized learning experiences and enhance reading comprehension (Kim, 2024). Recent international studies have reported significant improvements in the reading abilities of English as a Second Language (ESL) and English as a Foreign Language (EFL) learners through ChatGPT-assisted instruction (Ali et al., 2025; Kim, 2024). Furthermore, research conducted in Pakistan has highlighted the pedagogical potential of ChatGPT and other AI-assisted technologies for enhancing English language learning and academic writing, emphasizing the need for their responsible

integration into language education (Faiz et al., 2023; Rasool et al., 2023). Nevertheless, empirical evidence regarding the effectiveness of ChatGPT in improving literal reading comprehension among Pakistani ESL undergraduates remains limited.

Accordingly, this study addresses the following research questions:

1. Does the use of ChatGPT as a pedagogical tool significantly improve contextual meaning comprehension among Pakistani ESL undergraduates compared with traditional instruction?
2. Does the use of ChatGPT as a pedagogical tool significantly improve identification of the main idea among Pakistani ESL undergraduates compared with traditional instruction?
3. Does the use of ChatGPT as a pedagogical tool significantly improve identification of supporting details among Pakistani ESL undergraduates compared with traditional instruction?

2. Literature Review

2.1 English as a Second Language in Pakistan

The relationship between English and Pakistan is deeply rooted in colonial history and has evolved into an instrumental and aspirational one. Introduced during British colonial rule, English has continued to function as the language of the judiciary, higher education, civil services, and elite employment even after Pakistan's independence (Rahman, 2020). English is also the primary medium of instruction in higher education institutions recognized by the Higher Education Commission (HEC) of Pakistan. Consequently, Pakistani students learn English not only to communicate internationally but also to succeed in their academic and professional environments (Mahboob & Talaat, 2008; Nawaz et al., 2025).

Reading comprehension occupies a central position within this educational context. Undergraduate students are expected to read complex academic texts in English across disciplines such as engineering, medicine, social sciences, and the humanities. Nevertheless, research consistently indicates that many Pakistani undergraduates demonstrate reading proficiency below the expected level. Students frequently report inadequate vocabulary, limited reading strategies, and difficulty identifying the main ideas and supporting details as major barriers to effective reading comprehension (Ahmed et al., 2024; Shamim, 2011).

2.2 Literal Reading Comprehension: Sub-Skills and Difficulties

Reading comprehension is widely recognized as a multilevel cognitive process involving the decoding of linguistic information, the construction of propositional meaning, and the integration of textual information with prior knowledge (Kintsch & Van Dijk, 1978). Literal reading comprehension represents the foundational level of this process, requiring readers to retrieve information explicitly presented in the text without making inferential interpretations.

The present study focuses on three fundamental components of literal reading comprehension: contextual meaning, identification of the main idea, and identification of supporting details. Contextual meaning refers to understanding the meanings of words and phrases within a specific textual context. Identifying the main idea requires recognizing the central message of a passage, whereas identifying supporting details involves locating facts, examples, and explanations that reinforce the main idea.

These sub-skills present considerable challenges for ESL learners in Pakistan. Limited vocabulary often restricts students' ability to infer contextual meanings, particularly because many learners primarily use Urdu or regional languages outside academic settings. Likewise, identifying the main idea requires effective top-down processing and familiarity with English discourse organization, whereas classroom instruction in Pakistan frequently emphasizes bottom-up decoding and translation-based approaches (Park, 2018). Similarly, identifying supporting details requires sustained attention and the ability to distinguish essential information from less important details, skills that are not consistently emphasized in ESL classrooms (Shamim, 2011).

2.3 ChatGPT as a Pedagogical Tool for ESL Reading Instruction

Since its public release in late 2022, ChatGPT has attracted considerable scholarly attention for its potential applications in language education. According to Lin and Chen (2024), ChatGPT facilitates reading development through several instructional mechanisms. These include generating reading passages with comprehension questions, providing contextual vocabulary explanations, assisting learners in interpreting tone and cultural nuances, adapting reading materials to learners' proficiency levels, summarizing passages, identifying key ideas, and supporting critical reading through interactive dialogue. Collectively, these functions directly support the development of contextual meaning, identification of the main idea, and identification of supporting details.

Empirical evidence increasingly supports the effectiveness of ChatGPT in improving reading comprehension. Kim (2024), in a quasi-experimental study involving Korean EFL learners, reported statistically significant improvements in students' ability to identify main ideas after ChatGPT-assisted instruction. The study further demonstrated that learners who actively engaged in interactive dialogue with ChatGPT achieved greater improvements than those who relied on passive responses. Similarly, Ali et al. (2025) investigated the impact of ChatGPT on reading proficiency among Saudi Arabian Grade 10 ESL students and found significantly higher post-test scores for the experimental group ($M = 16.65$) than for the control group ($M = 9.35$), accompanied by an exceptionally large effect size (Cohen's $d = 8.50$).

Within the Pakistani context, research examining ChatGPT in language education is gradually emerging. Faiz et al. (2023) argued that ChatGPT serves as an effective writing aid for EFL learners by improving grammar, vocabulary, coherence, and overall writing proficiency while emphasizing the importance of balancing AI assistance with learners' autonomous writing development. Their study highlights the pedagogical value of integrating generative AI into English language instruction through carefully designed learning activities. Likewise, Rasool et al. (2023) compared AI-generated and human-written argumentative essays using a Systemic Functional

Linguistics framework. Their findings demonstrated that although ChatGPT produces logically organized texts with sophisticated clause complexes, certain discourse relations remain underdeveloped compared with human writing. These findings suggest that ChatGPT should be viewed as a complementary instructional tool rather than a replacement for human learning, reinforcing the importance of guided pedagogical implementation.

In Pakistan, digital and mobile learning technologies have already demonstrated positive effects on English language learning at the tertiary level (Ali et al., 2024). The integration of ChatGPT into Pakistani ESL classrooms therefore represents a natural progression of technology-enhanced language instruction. However, empirical evidence regarding its effectiveness in improving literal reading comprehension among Pakistani undergraduate ESL learners remains limited. The present study addresses this gap by examining the influence of ChatGPT on three essential literal reading comprehension sub-skills.

2.4 Theoretical Framework

The present study is grounded in the IDEE Framework proposed by Su and Yang (2023) for integrating generative artificial intelligence into educational settings. The framework comprises four interconnected components that promote responsible, effective, and pedagogically meaningful implementation of AI technologies in education (see Figure 1).

2.4.1 Identify the Desired Outcomes

The first stage emphasizes identifying clear educational objectives before integrating generative AI into teaching and learning. Establishing explicit learning outcomes ensures that AI technologies support rather than distract from instructional goals. In the present study, the desired outcome is the improvement of undergraduate students' literal reading comprehension skills.

2.4.2 Determine the Appropriate Level of Automation

The second stage focuses on selecting an appropriate level of AI integration. Depending on instructional objectives, AI may function as a fully automated instructional system or as a supplement to conventional teaching methods. In this study, ChatGPT was employed as a guided instructional support tool rather than replacing classroom teaching, allowing students to interact with AI while continuing to receive teacher guidance.

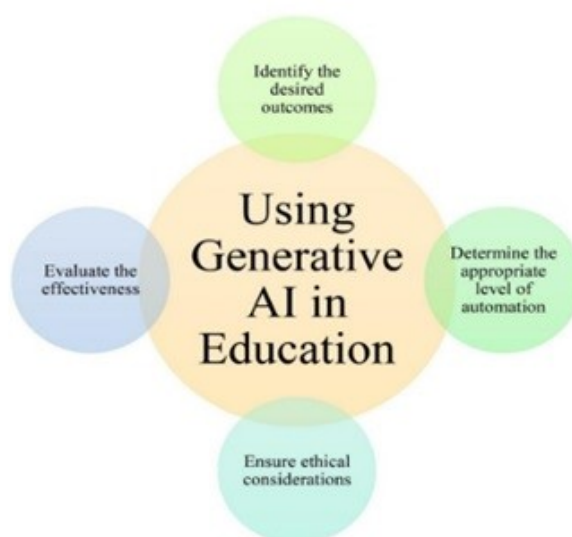
2.4.3 Ensure Ethical Considerations

The third component addresses ethical issues associated with the educational use of generative AI. These include minimizing algorithmic bias, promoting academic integrity, encouraging responsible AI use, and ensuring equitable learning opportunities. In this study, students were instructed to use ChatGPT as a learning companion rather than a substitute for independent learning, while responsible digital behavior and equal participation were continuously emphasized.

2.4.4 Evaluate the Effectiveness

The final component highlights the importance of systematically evaluating AI-supported instruction. Following this principle, the present study employed a quasi-experimental design involving experimental and control groups to determine the effectiveness of ChatGPT in enhancing literal reading comprehension among Pakistani ESL undergraduate students.

Figure 1: The IDEE Framework for Using Generative AI in Education (Su & Yang, 2023)



The IDEE framework is particularly appropriate for Pakistani higher education, where institutional readiness for AI adoption varies considerably between public and private universities. It provides a systematic and ethically grounded approach for integrating generative AI into language education while ensuring that emerging technologies are implemented responsibly and effectively.

3. Methodology

3.1 Research Design

This study employed a quantitative quasi-experimental research design to investigate the effectiveness of ChatGPT as a pedagogical tool in developing the literal reading comprehension skills of Pakistani ESL undergraduate students. Two intact undergraduate classes were selected, with one serving as the experimental group and the other as the control group. Both groups completed a pretest and a posttest to measure changes in their literal reading comprehension skills. The experimental group received instruction supported by ChatGPT-based pedagogical activities, whereas the control group was taught through traditional classroom instruction without the integration of ChatGPT. The pretest and posttest scores of both groups were compared to

determine the effectiveness of ChatGPT in improving students' reading comprehension performance.

3.2 Participants

A total of 78 undergraduate students ($n = 78$) enrolled in the first year of a four-year BS degree program in the Department of Computer Science at a public-sector university in Sindh, Pakistan, participated in this study. Purposive sampling was employed to select the participants because they were enrolled in the compulsory English Comprehension and Composition course. The participants were divided into an experimental group ($n = 39$) and a control group ($n = 39$). Informed consent was obtained from all participants before data collection, and ethical approval was secured from the relevant institutional authority.

3.3 Instrument

Data were collected using researcher-developed literal reading comprehension tests, which served as both the pretest and the posttest. The instrument consisted of three sections designed to assess the major components of literal reading comprehension:

- Contextual Meaning: Students identified the meanings of words and phrases within their textual contexts (8 items).
- Identification of the Main Idea: Students selected the sentence that best represented the central idea of a reading passage (1 item).
- Identification of Supporting Details: Students identified explicitly stated facts, examples, and supporting information presented in the passage (4 items).

Collectively, these components provided a comprehensive measure of students' literal reading comprehension by assessing vocabulary understanding, identification of the main idea, and recognition of explicitly stated textual information.

To establish face validity and content validity, the instrument was reviewed by three experienced ESL teachers. Subsequently, a pilot study involving 15 undergraduate students was conducted to determine the reliability of the instrument. The reliability analysis yielded a Cronbach's alpha coefficient of 0.83, indicating satisfactory internal consistency.

3.4 Instructional Procedures

The intervention was implemented over 12 weeks, consisting of one 90-minute instructional session per week, for a total of 12 sessions.

During the intervention, the experimental group received reading comprehension instruction supported by ChatGPT, whereas the control group received conventional teacher-led instruction without using ChatGPT. For the experimental group, ChatGPT was incorporated as a pedagogical tool to facilitate the development of literal reading comprehension skills. Specifically, ChatGPT was used to generate contextual vocabulary explanations, provide guided reading support, identify main ideas, and develop questions related to supporting details. Students interacted with reading

passages through teacher-guided ChatGPT-assisted activities designed to promote active engagement with the texts while strengthening their literal comprehension skills.

The instructional design was guided by the principles of responsible AI integration proposed in the IDEE framework (Su & Yang, 2023), ensuring that ChatGPT functioned as a learning support tool rather than replacing classroom instruction.

3.5 Data Analysis

The collected data were analyzed using IBM SPSS Statistics Version 26. The analysis consisted of the following procedures:

- Descriptive statistics (means and standard deviations) were calculated for both groups at the pretest and posttest stages.
- Independent-samples t tests were conducted on the pretest scores to determine the equivalence of the experimental and control groups before the intervention.
- Paired-samples t tests were performed within each group to examine improvements between the pretest and posttest.
- Independent-samples t tests were conducted on the posttest scores to compare the performance of the experimental and control groups following the intervention.

In addition, Cohen's d was calculated to determine the magnitude of the treatment effect (Cohen, 1988). The level of statistical significance for all inferential analyses was set at $\alpha = .05$.

4. Results

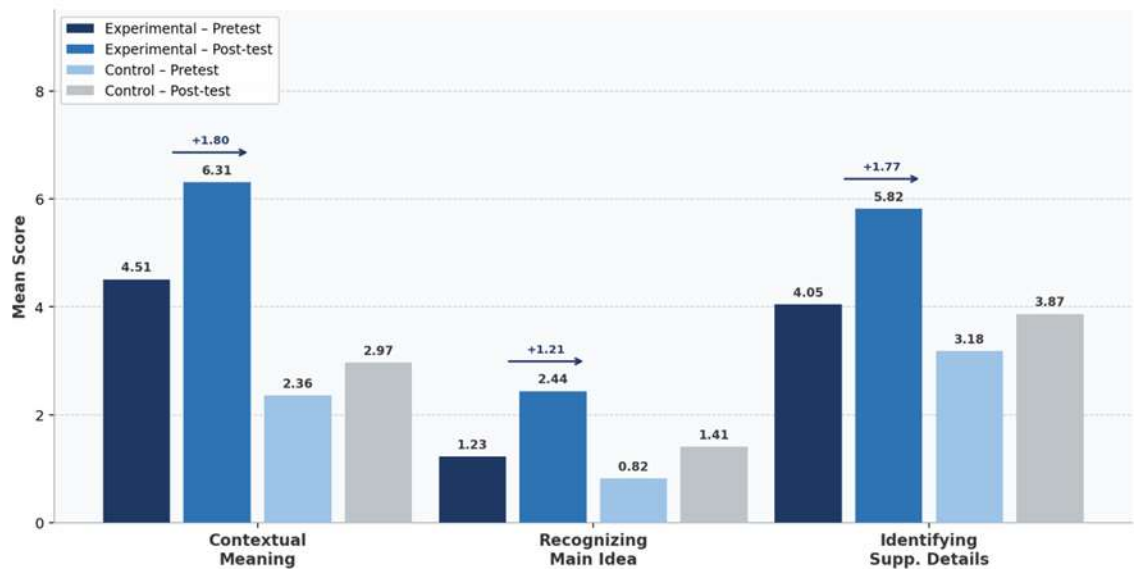
4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for both groups across the three literal reading comprehension sub-skills in the pre-test and post-test. The experimental group demonstrated substantially greater mean gains across all three sub-skills, including Contextual Meaning (+1.80), Recognising the Main Idea (+1.21), and Identifying Supporting Details (+1.77). In contrast, the control group showed comparatively smaller improvements across all sub-skills. These mean scores are illustrated in Figure 2.

Table 1: Descriptive Statistics: Pre-test and Post-test Scores by Group (n = 39 per group)

Sub-skill	Group	n	Pre M	Pre SD	Post M	Post SD	Gain
Contextual Meaning	Experimental	39	4.51	1.10	6.31	1.15	+1.80
	Control	39	2.36	0.96	2.97	1.06	+0.61
Recognising Main Idea	Experimental	39	1.23	0.99	2.44	1.07	+1.21
	Control	39	0.82	1.00	1.41	1.25	+0.59
Identifying Supp. Details	Experimental	39	4.05	0.97	5.82	1.12	+1.77
	Control	39	3.18	1.10	3.87	1.28	+0.69

Figure 2: Mean Pre-test and Post-test Scores by Group and Sub-skill (N = 78)



4.2 Pretest Group Equivalence

Initial equivalence between groups on Recognising the Main Idea ($t = 1.83$, $df = 76$, $p = .071$) not statistically significant was ensured by independent-samples t -tests on pretest scores (Table 2). Contextual Meaning ($t = 9.23$, $p < .001$) and Identifying Supporting Details ($t = 3.71$, $p < .001$) differences indicate inherent differences in ESL reading between the two sections of the university; they are addressed analytically by comparing the gain scores and post-test results.

Table 2: Pretest Group Equivalence: Independent-Samples t -Test Results

Sub-skill	Exp M (SD)	Ctrl M (SD)	t	df	p
Contextual Meaning	4.51 (1.10)	2.36 (0.96)	9.23	76	< .001
Recognising Main Idea	1.23 (0.99)	0.82 (1.00)	1.83	76	.071
Identifying Supp. Details	4.05 (0.97)	3.18 (1.10)	3.71	76	< .001

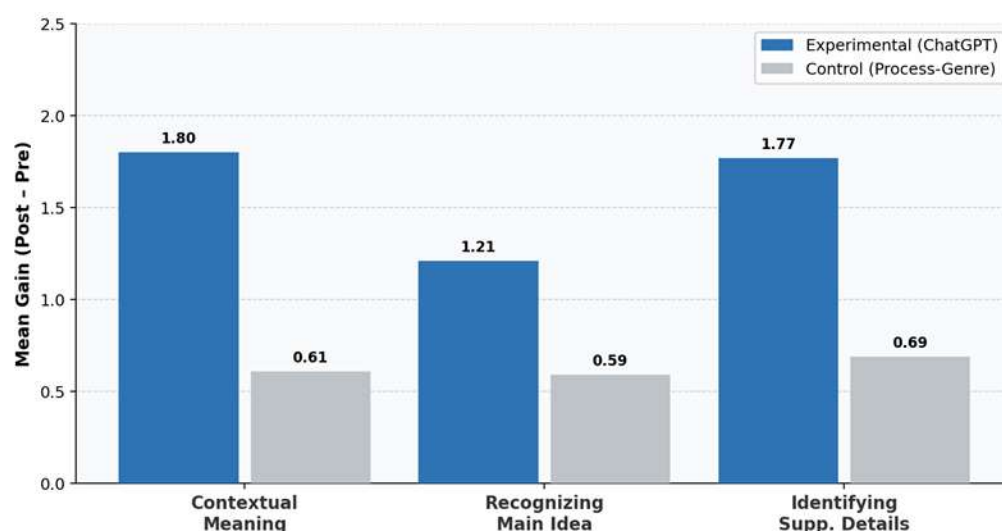
4.3 Within-Group Gains: Paired-Samples t -Tests

Table 3 shows the results of the paired-samples t -test of the pre-to-post gains in each group. The comparison of all of them was significant at $p < .001$. The effect sizes were very large in the experimental group: Contextual Meaning ($t = -19.66$, $d = 3.15$), Recognising the Main Idea ($t = -14.41$, $d = 2.31$), and Identifying Supporting Details ($t = -20.61$, $d = 3.30$). Gains in the control group were also significant and much less: Contextual Meaning ($d = 1.13$), Recognising the Main Idea ($d = 1.08$), and Identifying Supporting Details ($d = 1.22$). These gain scores are presented relative to each other in Figure 3.

Table 3: Paired-Samples t-Test: Within-Group Pre-to-Post Gains

Sub-skill	Group	Pre M	Post M	t	df	p	Cohen's d
Contextual Meaning	Experimental	4.51	6.31	-19.66	38	< .001	3.15
	Control	2.36	2.97	-7.07	38	< .001	1.13
Recognising Main Idea	Experimental	1.23	2.44	-14.41	38	< .001	2.31
	Control	0.82	1.41	-6.71	38	< .001	1.08
Identifying Supp. Details	Experimental	4.05	5.82	-20.61	38	< .001	3.30
	Control	3.18	3.87	-7.60	38	< .001	1.22

Figure 3: Mean Gain Scores (Post-test minus Pre-test) by Group and Sub-skill



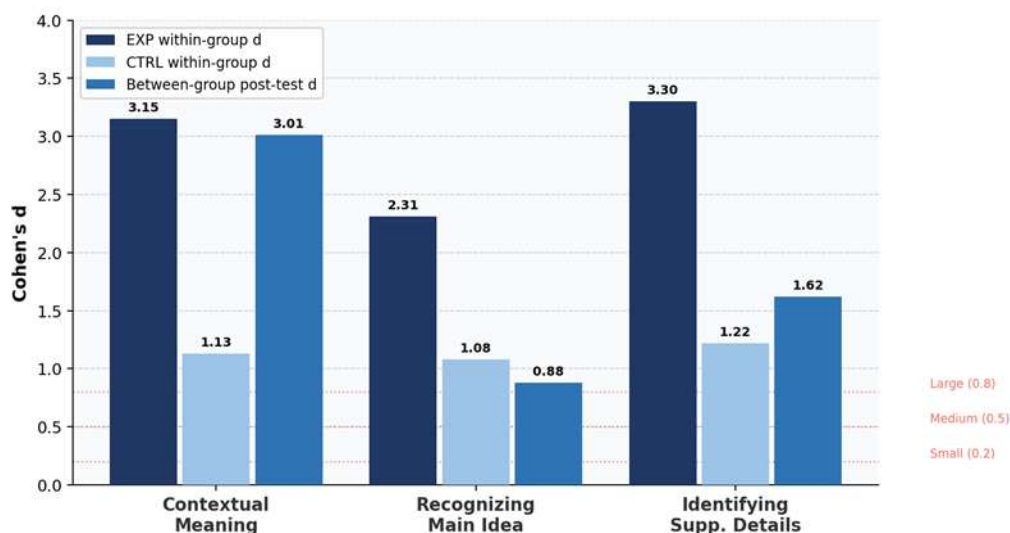
4.4 Between-Group Post-Test Comparisons

Post-test scores (Table 4) were confirmed as independent-samples t-tests to show that, the experimental group significantly out-scored the control group on all three sub-skills. The largest between-group effect was observed for Contextual Meaning ($t = 13.29$, $p < .001$, $d = 3.01$), followed by Identifying Supporting Details ($t = 7.15$, $p < .001$, $d = 1.62$) and recognising the Main Idea ($t = 3.89$, $p < .001$, $d = 0.88$). All the effect sizes were larger than the one that Cohen (1988) describes as a large effect ($d \geq 0.80$). All the effect sizes are visualised in figure 4.

Table 4: Post-Test Between-Group Comparisons: Independent-Samples t-Test

Sub-skill	Exp Post M (SD)	Ctrl Post M (SD)	t	Df	p	Cohen's d
Contextual Meaning	6.31 (1.15)	2.97 (1.06)	13.29	76	< .001	3.01
Recognising Main Idea	2.44 (1.07)	1.41 (1.25)	3.89	76	< .001	0.88
Identifying Supp. Details	5.82 (1.12)	3.87 (1.28)	7.15	76	< .001	1.62

Figure 4: Effect Sizes (Cohen's d) – Within-group and Between-group Comparisons



5. Discussion

5.1 Contextual Meaning in the Pakistani ESL Context

The findings give a very positive response to RQ1. The experimental group showed a significant improvement between 4.51 and 6.31 ($d = 3.15$ within-group; $d = 3.01$ between groups at post-test), which is much greater than the small improvement of the control group. In line with Ali et al. (2025), who found that Saudi ESL students rated the vocabulary support provided by ChatGPT as one of the most useful aspects of their learning process, Pakistani undergraduates in the present study were most likely to take advantage of the ability to ask ChatGPT follow-up questions regarding particular words in responsive manner. This outcome is a direct reflection of the desired outcome, which is personalised contextual vocabulary comprehension at scale, in the first component of the IDEE framework (Su and Yang, 2023). Other students found the explanations of ChatGPT too detailed at first, as Kim (2024) notes that AI can sometimes use the register of an academic expert, which supports the need to formulate prompts under teacher guidance.

5.2 The Pakistani ESL Context Recognising the Main Idea

The between-group advantage was statistically significant in main idea recognition ($d = 0.88$), which is consistent with the results of Kim (2024) with Korean learners ($d = 0.9$). The intermediate effect size in comparison to the other two sub-skills is indicative of the higher-order cognitive load of this skill: in the Pakistani ESL setting, where students have had little explicit training in English discourse structure and thesis identification, identifying the main idea involves more than literal understanding, but rather interaction with the logical structure of English academic argument. The most successful ChatGPT interactions in the context of main idea tasks in this study were those where the students disagreed with the initial suggestion of the AI and negotiated extensively about why a specific sentence was the thesis- a dialogic practice that Kim (2024) also found to be the primary source of main idea understanding gains.

5.3 Identifying Supporting Details in the Pakistani ESL Context

The largest within-group effect size was observed in the experimental group in Identifying Supporting Details ($d = 3.30$) and a high between-group effect at post-test ($d = 1.62$). The capacity of ChatGPT to list and categorize particular textual data offers a potent cognitive scaffold to Pakistani ESL learners, many of whom are exposed to English academic texts as dense, unfamiliar wholes, as opposed to logically structured sequences of argument and evidence. Students were able to build both retrieval accuracy and habitual textual attention by asking ChatGPT to provide the main supporting points in each paragraph and then checking each point against the original text.

This result is consistent with the fact that Ali et al. (2025) found that the summarisation ability of ChatGPT was the most appreciated among Saudi ESL learners, and is in line with the IDEE framework that focuses on assessing effectiveness by using measurable learning outcomes (Su and Yang, 2023). The fact that large effects are consistent across all three sub-skills indicates that the benefits of ChatGPT are not limited to a single facet of literal comprehension but work in a broad manner across the spectrum of skills needed to be successful in academic reading in English.

5.4 Limitations

A number of limitations should be mentioned. To begin with, the sample was selected in one of the public universities in Sindh, Pakistan, which restricts the generalization to other Pakistani provinces, private universities, or madrassah-based institutions where the environment of English language may vary significantly. The research was limited to literal comprehension; no inferential and evaluative reading skills were studied. There was no delayed post-test, and thus the sustainability of gains cannot be established.

6. Conclusion and Pedagogical Implications

This quasi-experimental experiment offers solid empirical data that ChatGPT-based instruction is a powerful tool that may substantially improve the literal reading comprehension of undergraduate ESL students in three sub-skills: contextual meaning, main idea recognition, and supporting detail identification, which yield significantly larger effects than the traditional method of teaching reading comprehension skills in a Pakistani university setting ($N = 78$; $n = 39$ per group). The results, with effect sizes of $d = 0.88$ to $d = 3.30$ in the experimental group, constitute a strong empirical support of the pedagogical value of ChatGPT in the development of ESL reading comprehension skills.

Pakistani ESL teachers have three implications. To begin with, ChatGPT needs to be incorporated as an organized auxiliary tool in ESL reading classes, with the implementation being principled, ethical, and effectiveness-oriented, based on the IDEE framework (Su and Yang, 2023). Second, explicit prompt training is critical: Pakistani ESL students who train to create specific, targeted English-language queries elicit much more value in terms of comprehension in ChatGPT than those who use vague prompts, and the very process of creating specific queries in English is itself a valuable practice in language. Third, educators must actively practise of questioning ChatGPT. Future studies may examine the effect of ChatGPT on inferential and evaluative reading comprehension in the Pakistani ESL setting.

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Bio-note:

Abdul Majeed is a PhD Scholar in English Linguistics at Hamdard University, Karachi, Pakistan. His research interests include English language teaching (ELT), applied linguistics, second language acquisition, reading comprehension, educational technology, artificial intelligence in language education, and computer-assisted language learning (CALL). He is particularly interested in investigating the pedagogical applications of generative AI to enhance English language learning among ESL learners.

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