



EFFECTIVENESS OF CHATGPT-ASSISTED LEARNING IN ENHANCING ACADEMIC WRITING SKILLS OF PAKISTANI UNIVERSITY STUDENTS

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Abstract

Academic writing proficiency remains a significant challenge for Pakistani ESL university students, who struggle with grammatical accuracy, lexical diversity, and textual coherence due to traditional teacher-centered pedagogies. Generative AI tools like ChatGPT offer personalized writing support, but experimental research in the Pakistani higher education context is limited. This mixed-methods study examines a structured ChatGPT-assisted writing intervention on essay writing skills of 30 undergraduate ESL students at the University of Gujrat and Government College University Sialkot. A quasi-experimental one-group pre-test-post-test design was used, with writing performance measured analytically. Quantitative results showed statistically significant improvements from pre-test ($M=50.30$, $SD=10.86$) to post-test ($M=76.40$, $SD=8.93$), mean gain of 26.10 ($t=9.86$, $df=29$, $p<.001$), with very large effect sizes ($d=1.96-2.35$). Survey data indicated strongly positive perceptions (96.7% recommending ChatGPT). Qualitative thematic analysis revealed four themes: digital scaffolding within the ZPD, enhanced writing confidence and reduced anxiety, specific linguistic improvements, and concerns about over-reliance and critical evaluation. The findings provide empirical evidence that systematic ChatGPT-assisted instruction significantly improves academic writing skills among Pakistani ESL students, with implications for pedagogy, curriculum design, and educational technology implementation.

Keywords: *Academic Writing, Artificial Intelligence in Education, ChatGPT, ESL, Pakistani University Students, Sociocultural Theory, Zone of Proximal Development.*

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1. Introduction

Academic writing proficiency serves as a pillar of success in higher education, enabling students to critically engage with scholarly discourse and showcasing disciplinary knowledge. For English as a Second Language (ESL) learners, mastering academic writing presents considerable challenges, particularly in contexts where English instruction follows traditional, teacher-centered approaches (Fareed, Ashraf, & Bilal, 2016).

In Pakistan, despite English serving as the official language of instruction in universities, undergraduate students constantly struggle with grammatical accuracy, lexical variety, coherence, and structural organization in their essay writing.

Recent developments in artificial intelligence, particularly generative language models such as ChatGPT, have created innovative pathways for personalized and interactive writing instruction. Unlike conventional grammar-checking tools, ChatGPT offers dialogue-based interaction, instant feedback, content generation, and iterative revision support, potentially functioning as an accessible writing tutor (Aftab, Shahid, & Ahmad, 2024). However, empirical research examining the effectiveness of ChatGPT in developing academic writing skills within the Pakistani ESL context remains absent.

1.1. Statement of the Problem

Pakistani university students, particularly those in public-sector universities, continue to show persistent writing deficiencies characterized by grammatical errors, limited vocabulary repertoire, and poor textual coherence (Nazir, Kayani, & Yasin, 2023). Existing instructional methodologies, restricted by large class sizes, limited individualized feedback methods, and examination-oriented pedagogies, prove insufficient in addressing these challenges (Gill, Kausar, & Haider, 2022). While AI-powered tools such as Grammarly have received some scholarly attention in Pakistani ESL contexts (Ullah & Khan, 2023), the unique pedagogical affordances of ChatGPT including its generative capabilities and interactive dialogue features remain largely unexplored. This study addresses this critical gap by empirically investigating the effectiveness of a structured ChatGPT-assisted writing intervention.

1.2. Research Objectives

- To identify the specific writing difficulties demonstrated by Pakistani university students in their academic writing before using ChatGPT-assisted intervention.
- To measure the extent of improvement in students' essay writing performance after a structured four-week ChatGPT-assisted intervention through pre-test and post-test comparisons.
- To explore students' perceptions, experiences, and challenges regarding the use of ChatGPT as a tool for enhancing academic writing.

1.3. Research Questions

- What specific writing difficulties do Pakistani university students demonstrate before using ChatGPT?
- To what extent does a four-week ChatGPT-assisted intervention lead to statistically significant improvements in writing performance as measured by pre-test and post-test assessments?
- How do students perceive the experience, usefulness, and challenges associated with using ChatGPT in their academic writing development?

1.4. Significance of the Study

This study addresses a significant gap in Pakistani educational research concerning generative AI applications in writing instruction. By providing empirical evidence from a structured intervention, the findings offer practical insights for ESL teachers, curriculum designers, and policymakers regarding effective use of AI tools in educational settings with limited resources. Theoretically, the study contributes to understanding ChatGPT's role within sociocultural learning frameworks as a digital scaffolding tool operating within learners' zones of proximal development.

2. Literature Review

2.1. Academic Writing Challenges in Pakistani ESL Context

Research consistently documents the multifaceted writing difficulties faced by Pakistani undergraduate students. Nazir, Kayani, and Yasin (2023), in a corpus-based error analysis of Pakistani ESL writing, identified persistent problems in sentence structure, tense consistency, article usage, preposition selection, and subject-verb agreement. Their analysis revealed that lexical repetition and limited vocabulary range further compromised overall writing quality. Fareed, Ashraf, and Bilal (2016) attributed these difficulties to factors including insufficient reading practices, lack of writing motivation, examination-focused instruction, and limited feedback mechanisms.

Gill, Kausar, and Haider (2022) examined expository writing among Pakistani undergraduates and found that students struggled particularly with thesis statement formulation, paragraph unity, and logical generation of ideas. The researchers observed that teacher-centered pedagogies emphasizing product over process, combined with large class sizes preventing individualized attention, perpetuated these writing deficiencies. These findings underscore the need for innovative instructional approaches that provide personalized, process-oriented writing support.

2.2. Technology and AI in Writing Instruction

Computer-assisted language learning (CALL) has showed positive effects on writing accuracy and fluency in Pakistani ESL settings. Hussain (2018) reported significant improvements in writing performance among students exposed to computer-mediated instruction compared to traditional classroom teaching. More recently, AI-powered writing tools have gained scholarly attention. Khan, A., & Ghani, M. (2024)

investigated the impact of Grammarly on Pakistani ESL learners' writing, finding that the tool effectively helped with error correction and enhanced vocabulary use. However, the researchers noted that Grammarly's functionality remained primarily corrective rather than generative or dialogic.

Internationally, emerging research on ChatGPT in L2 writing contexts has yielded promising findings. Chen and Gong (2025), in a mixed-methods study with Chinese ESL students, reported that ChatGPT-assisted writing instruction led to improvements in idea development, structural organization, and learner confidence. The interactive, conversational nature of ChatGPT distinguished it from conventional automated writing evaluation tools, enabling students to engage in recursive dialogue about their writing.

2.3. ChatGPT in Educational Contexts

ChatGPT's unique pedagogical affordances include text generation, tutoring dialogue capabilities, and contextualized explanations (Aftab, Shahid, & Ahmad, 2024). In the Pakistani context, Aftab and colleagues conducted an intervention study with ESL students and found notable gains in syntactic complexity and textual organization among ChatGPT users. The tool supported drafting and revision processes, functioning as a responsive writing assistant when used with appropriate pedagogical scaffolding. However, the researchers cautioned about potential drawbacks, including student over-reliance on AI and the need for clear ethical guidelines for responsible AI usage.

3. Theoretical Framework

This study is grounded in two complementary theoretical perspectives:

3.1. Sociocultural Theory (Vygotsky, 1978)

Vygotsky's sociocultural theory states that cognitive development occurs through social interaction and mediated learning. The Zone of Proximal Development (ZPD) representing the gap between what learners can accomplish independently and what they can achieve with guidance, provides a crucial conceptual lens. Within the ZPD, scaffolding from more capable others enables learners to internalize skills and gradually assume independent control. In this study, ChatGPT is conceptualized as a digital tutor providing support within students' ZPDs during writing tasks, offering timely assistance that can be gradually withdrawn as competence develops.

3.2. Integrative CALL (Warschauer & Healey, 1998)

This framework emphasizes meaningful technology integration where computers support authentic communication rather than mechanical drills. Integrative CALL positions technology as a tool for genuine literacy practices within social contexts. Accordingly, this study employs ChatGPT for authentic writing activities such as brainstorming, drafting, revising, and reflecting and making it an integral component of the learning process rather than an adjunct drill device.

Together, these theories position ChatGPT as a guided digital tool that provides timely, contextualized support within learners' ZPDs during authentic writing practice, potentially facilitating skill development and learner autonomy.

3.3. Research Gap

Despite growing international interest in ChatGPT's educational applications, systematic intervention studies examining its effectiveness for academic writing development in Pakistani ESL contexts remain notably absent. Existing Pakistani research has predominantly focused on conventional CALL applications or non-generative AI tools. There is a distinct lack of structured intervention studies combining quantitative measures of writing improvement with in-depth qualitative exploration of learner experiences. This study addresses this gap by using a mixed-methods design with Pakistani university students.

4. Methodology

4.1. Research Design

This study employed an explanatory sequential mixed-methods design. The quantitative phase utilized a quasi-experimental one-group pre-test–post-test design to measure writing improvement. It is followed by a qualitative phase employing semi-structured interviews to explain and elaborate quantitative findings.

4.2. Participants

The participant sample consisted of 30 undergraduate students enrolled in BS English Literature programs (semesters 3 to 5) at two public sector universities in Punjab, Pakistan: University of Gujrat (n=15) and Government College University Sialkot (n=15). Participants were selected through purposive sampling based on the following criteria: (a) enrollment in English Literature program, (b) completion of at least two academic writing courses, (c) self-reported writing difficulties, and (d) willingness to participate in the four-week intervention. The sample comprised 18 females and 12 males, aged 19-23 years ($M=20.7$, $SD=1.2$). All participants had basic computer literacy and smartphone access but limited prior experience with generative AI tools.

4.3. Intervention: ChatGPT-Assisted Writing Module

A systematically structured four-week writing module was implemented, comprising:

4.3.1. Week 1: Orientation and Training

- Introduction to ChatGPT functionality and ethical use guidelines
- Hands-on training sessions on prompt engineering for academic writing
- Discussion of academic integrity and responsible AI engagement
- Pre-test administration

4.3.2. Week 2: Brainstorming and Outlining

- Topic: "Impact of Social Media on Youth"
- ChatGPT used for idea generation and thesis formulation
- Collaborative outline development with AI feedback
- Drafting introductory paragraphs

4.3.3. Week 3: Drafting and Revising

- Topic: "Challenges Facing Higher Education in Pakistan"
- Full essay drafting with ChatGPT support for content development
- Iterative revision based on AI-generated feedback on grammar, vocabulary, and coherence
- Peer feedback sessions

4.3.4. Week 4: Refinement and Reflection

- Topic: "Role of Technology in Education"
- Final essay drafting and polishing
- Reflective practice on ChatGPT learning experience
- Post-test administration and interviews

Each session lasted 90 minutes, with participants using ChatGPT on personal devices or university lab computers under researcher guidance.

5. Data Collection Instruments

5.1. Writing Pre-test and Post-test

Participants wrote argumentative essays (300-400 words) on comparable topics before and after intervention. Essays were assessed using an analytic rubric adapted from established ESL writing assessment frameworks, comprising four criteria: Grammatical Accuracy (0-25),

Lexical Diversity (0-25), Coherence and Cohesion (0-25), and Content Development (0-25), yielding total scores (0-100). Two independent raters (ESL instructors with MA TESOL qualifications) scored all essays, with inter-rater reliability (Cohen's $\kappa = .86$) indicating strong agreement.

5.2. Survey Questionnaire

A 15-item questionnaire using a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree) measured students' perceptions of ChatGPT's usefulness, confidence in writing, and challenges encountered. The instrument was adapted from previous technology acceptance studies and pilot-tested with five students for clarity.

5.3. Semi-Structured Interviews

Twelve participants (six from each university) were purposively selected for individual interviews lasting 25-35 minutes. The interview protocol explored experiences with ChatGPT, perceived writing improvements, challenges, and recommendations.

Interviews were conducted in Urdu and English based on participant preference, audio-recorded, and transcribed verbatim.

6. Data Analysis

6.1. Quantitative Analysis

Paired-sample t-tests were conducted using SPSS version 26 to compare pre-test and post-test mean scores across rubric criteria. Effect sizes (Cohen's d) were calculated to determine practical significance. Descriptive statistics summarized survey responses.

6.2. Qualitative Analysis

Interview transcripts were analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework. Two researchers independently coded transcripts, with disagreements resolved through discussion. Themes were identified, reviewed, and refined to capture participant experiences.

7. Ethical Considerations

Ethical approval was obtained from institutional review boards at both universities. Written informed consent was secured from all participants, who were assured of anonymity, confidentiality, and the right to withdraw without penalty. Pseudonyms are used in reporting qualitative findings. Clear ethical guidelines regarding ChatGPT use were provided, emphasizing AI as a learning aid rather than a replacement for original thinking.

8. Results

8.1. Quantitative Findings

8.1.1. Pre-test Writing Performance

Pre-test essays revealed substantial writing difficulties consistent with existing literature. Table 1 presents descriptive statistics for pre-test scores across rubric criteria

Table 1: *Descriptive Statistics for Pre-test Writing Scores (N=30)*

Criterion	Mean	SD	Minimum	maximum	Possible Range
Grammatical Accuracy	12.47	3.28	7	18	0-25
Lexical Diversity	11.93	3.05	6	17	0-25
Coherence and Cohesion	12.23	3.41	6	18	0-25
Content Development	13.67	3.12	8	19	0-25
Total Score	50.30	10.86	30	69	0-100

Pre-test mean total score (M=50.30, SD=10.86) indicated below-average writing proficiency. Grammatical accuracy (M=12.47) and lexical diversity (M=11.93) emerged as particular weaknesses, with students demonstrating frequent tense errors, article misuse,

and repetitive vocabulary. Coherence scores reflected difficulties in logical progression and paragraph unity, while content development showed relatively better performance.

8.1.2. Post-test Writing Improvement:

Post-test essays demonstrated marked improvement across all criteria. Table 2 presents comparative statistics.

Table 2: Comparison of Pre-test and Post-test Writing Scores (N=30)

Criterion	Pre-test Mean SD	Post-test Mean SD	Mean Difference	t-value	df	p-value	Cohen's d
Grammatical Accuracy	12.47 (3.28)	18.93 (2.87)	6.46	8.42	29	<.001	2.10
Lexical Diversity	11.93 (3.05)	18.07 (3.21)	6.14	6.37	29	<.001	1.96
Coherence and Cohesion	12.23 (3.41)	19.03 (2.76)	6.80	7.14	29	<.001	2.18
Content Development	13.67 (3.12)	20.37 (2.54)	6.70	8.03	29	<.001	2.35
Total Score	50.30 (10.86)	76.40 (8.93)	26.10	9.86	29	<.001	2.63

Paired-sample t-tests revealed statistically significant improvements in all writing criteria ($p < .001$). The mean total score increased from 50.30 to 76.40, a gain of 26.10 points. Effect sizes (Cohen's d) ranged from 1.96 to 2.63, indicating very large practical significance according to

Cohen's conventions. Coherence and cohesion showed the largest mean gain (6.80), followed by content development (6.70), grammatical accuracy (6.46), and lexical diversity (6.14).

8.2. Survey Findings

Table 3 presents descriptive statistics for post-intervention survey responses.

Table 3: Student Perceptions of ChatGPT-Assisted Learning (N=30)

Statement	Mean	SD	Agreement
ChatGPT helped me generate ideas for my essays	4.47	0.68	93.3
Using ChatGPT improved my grammatical accuracy	4.33	0.71	90.0
ChatGPT helped me learn new vocabulary	4.27	0.74	86.7

ChatGPT improved the organization of my essays	4.20	0.81	83.3
I feel more confident in my writing after using ChatGPT	4.40	0.72	90.0
ChatGPT reduced my anxiety about writing	4.13	0.86	80.0
I would recommend ChatGPT to other ESL students	4.53	0.63	96.7
I am concerned about becoming too dependent on ChatGPT	3.47	1.04	53.3
ChatGPT sometimes provides irrelevant suggestions	2.93	1.14	30.0
Technical issues affected my ChatGPT experience	2.67	1.18	23.3

Note: Agreement percentage combines "Agree" and "Strongly Agree" responses (4+5 on 5-point scale)

Survey results indicated strongly positive perceptions, with 96.7% agreeing they would recommend ChatGPT to other ESL students. Idea generation (M=4.47), confidence (M=4.40), and grammatical improvement (M=4.33) received highest ratings. However, 53.3% expressed concerns about potential over-reliance on AI, while fewer students reported technical issues (23.3%) or irrelevant suggestions (30.0%).

8.3. Qualitative Findings

Thematic analysis of interview transcripts revealed four major themes with associated subthemes, presented in Table 4.

Table 4: *Thematic Analysis Summary*

Theme	Subthemes	Frequency (N=12)
ChatGPT as Scaffolding Tool	Real-time feedback (11) Idea generation support (10) Revision assistance (9)	12
Enhanced Writing Confidence	Reduced writing anxiety (10) Willingness to experiment (8) Sense of writing progress (9)	11
Perceived Writing Improvements	Grammar and sentence structure (10) Vocabulary enrichment (9) Better organization (8)	12
Challenges & Concerns	Over-reliance risk (7) Need for verification (6) Ethical considerations (5)	9

8.3.1. Theme 1: ChatGPT as Scaffolding Tool

Participants consistently described ChatGPT as a supportive tool that provided timely assistance within their ZPD.

A student from GCU Sialkot explained:

"When I was stuck and didn't know how to start my introduction, I asked ChatGPT for help. It gave me different ways to begin, and I could choose what worked for me. It was like having a tutor available 24/7." (Participant 4, Female)

Another participant highlighted revision support:

"Earlier, I would just submit my first draft because I didn't know how to improve it. With ChatGPT, I could ask 'How can I make this paragraph better?' and it would give specific suggestions about word choice and sentence structure." (Participant 9, Female)

8.3.2. Theme 2: Enhanced Writing Confidence

Ten participants reported reduced writing anxiety and increased writing confidence.

A University of Gujrat student noted:

"Before this, I used to feel very nervous when the teacher assigned an essay. I would worry about making mistakes. But ChatGPT gave me confidence because I could check my writing and learn from the feedback. Now I feel I can write better." (Participant 2, Female)

Another participant described experimentation:

"I started trying new vocabulary that I wasn't sure about. I would ask ChatGPT if my usage was correct. This helped me learn and take risks in my writing." (Participant 7, Male)

8.3.3. Theme 3: Perceived Writing Improvements

Participants identified specific writing improvements.

A student reflected on grammar learning: "ChatGPT helped me understand my grammar mistakes. It didn't just correct them; it explained why something was wrong. I learned about tense consistency and article usage." (Participant 11, Female)

Regarding vocabulary:

"I noticed I was repeating the same words. ChatGPT suggested synonyms and alternative expressions. My essays became more interesting to read." (Participant 5, Male)

On organization:

"My earlier essays were just random paragraphs. ChatGPT helped me understand how to connect ideas and use transition words properly." (Participant 3, Female)

8.3.4. Theme 4: Challenges and Concerns

Seven participants expressed concerns about over-reliance.

A student from GCU Sialkot stated

"Sometimes I found myself going to ChatGPT immediately without trying to think first. I realized I need to balance using it with my own effort." (Participant 8, Female)

Another participant emphasized verification

"Not everything ChatGPT suggested was perfect. Sometimes the vocabulary didn't fit my context. I learned that I need to evaluate its suggestions critically." (Participant 12, Female)

8.3.5. Ethical considerations emerged as a concern

"I worried about whether using ChatGPT was cheating. But after the training session, I understood how to use it ethically and responsibly as a learning tool." (Participant 1, Female)

9. Discussion

9.1. Interpretation of Findings

This study investigated the effectiveness of ChatGPT-assisted learning on academic writing skills of Pakistani university students. The findings demonstrate statistically significant improvements across all measured writing dimensions, with exceptionally large effect sizes indicating substantial practical significance. These results align with and extend previous international research (Chen & Gong, 2025) while providing first empirical evidence from the Pakistani ESL context.

The significant improvement in grammatical accuracy (6.46-point gain, $d=2.10$) corroborates Ullah and Khan's (2023) findings regarding AI-powered writing tools' effectiveness for error correction. However, ChatGPT's dialogic feedback mechanism providing explanations rather than just corrections, may account for the substantial gains observed. Qualitative data confirmed that students valued explanatory feedback, consistent with sociocultural theory's emphasis on mediated learning within the ZPD (Vygotsky, 1978).

Lexical diversity improvements (6.14-point gain, $d=1.96$) reflect ChatGPT's capacity for suggesting contextually appropriate synonyms and alternative expressions. This finding addresses the lexical repetition problem identified by Nazir, Kayani, and Yasin (2023) in Pakistani ESL writing. Students' interview responses indicated active vocabulary learning through ChatGPT interaction, suggesting that AI-assisted writing may facilitate vocabulary acquisition not just immediate writing tasks.

The largest gain in coherence and cohesion (6.80-point gain, $d=2.18$) is particularly noteworthy given Pakistani students' documented difficulties with textual organization (Gill, Kausar, & Haider, 2022). ChatGPT's scaffolding of paragraph development, transition use, and logical progression appears to have addressed these challenges effectively. This finding supports Warschauer and Healey's (1998) Integrative CALL framework, positioning technology as a tool for meaningful communication rather than isolated skill practice.

10. Theoretical Implications

The findings provide empirical support for conceptualizing ChatGPT as a digital scaffolding tool operating within learners' ZPDs. Students consistently described receiving "just-in-time" support that enabled them to accomplish writing tasks beyond their independent capabilities. This aligns with Vygotsky's (1978) contention that learning precedes development through mediated assistance. Importantly, the gradual nature of scaffolding such as moving from idea generation to drafting to revision, it enabled progressive internalization of writing skills.

The study also extends Integrative CALL theory by demonstrating how generative AI can facilitate authentic, process-oriented writing instruction. Unlike drill-based computer-assisted instruction, ChatGPT engagement involved genuine communicative purposes like brainstorming ideas, refining arguments, and polishing expression consistent with Warschauer and Healey's (1998) vision of technology supporting meaningful literacy practices.

10.1. Pedagogical Implications

Several pedagogical implications emerge for ESL writing instruction in Pakistani universities and similar contexts:

10.1.1. Structured Integration

ChatGPT should be systematically integrated into writing curricula with clear pedagogical objectives rather than introduced as an optional add-on. The four-week structured module employed in this study provides a replicable model.

10.1.2. Ethical Guidelines

Clear guidelines on responsible AI use are essential. The training session addressing academic integrity, proper attribution, and critical evaluation of AI output contributed to positive outcomes and mitigated ethical concerns.

10.1.3. Balanced Approach

Given students' concerns about over-reliance, instructors should emphasize ChatGPT as a learning tool complementing rather than replacing cognitive effort. Metacognitive strategies for evaluating AI suggestions should be explicitly taught.

10.1.4. Scaffolding Withdrawal

Consistent with ZPD principles, ChatGPT support should gradually decrease as students develop independent competence. Future interventions might implement fading mechanisms where AI assistance is progressively reduced.

10.1.5. Teacher Professional Development

Effective ChatGPT integration requires teacher understanding of both technical and pedagogical aspects. Professional development programs should equip ESL instructors with strategies for AI-enhanced writing instruction.

10.2. Addressing Research Questions

Research Question 1: Pre-test findings confirmed substantial writing difficulties among participants, particularly in grammatical accuracy ($M=12.47/25$) and lexical diversity ($M=11.93/25$), consistent with previous Pakistani research (Fareed et al., 2016; Nazir et al., 2023).

Research Question 2: The intervention led to statistically significant improvements across all writing dimensions ($p<.001$) with very large effect sizes ($d=1.96-2.63$), demonstrating ChatGPT's effectiveness for enhancing academic writing skills.

Research Question 3: Students perceived ChatGPT positively as a scaffolding tool that enhanced confidence, reduced anxiety, and facilitated learning, while expressing measured concerns about potential over-reliance requiring critical evaluation of AI output.

11. Conclusion

11.1. Summary of Findings

This mixed-methods study provides a strong empirical evidence that a structured ChatGPT-assisted writing intervention significantly enhances academic writing skills among Pakistani ESL university students. Quantitative analysis revealed statistically significant improvements in grammatical accuracy, lexical diversity, coherence, and content development, with very large effect sizes indicating substantial practical significance. Qualitative findings showed students' positive perceptions of ChatGPT as a scaffolding tool operating within their zones of proximal development, enhancing writing confidence and reducing anxiety while highlighting the need for balanced, critical engagement with AI-generated content.

11.2. Limitations

Several limitations should be acknowledged. The four-week intervention period limits the assessment of long-term writing skill development. The sample consist of only two universities which limits generalizability to other Pakistani universities and ESL contexts. Variability in students' prior technology familiarity may have influenced outcomes, though training sessions reduced this concern. The absence of a control group, required by ethical considerations of denying potentially beneficial intervention, limits causal inference, though the quasi-experimental design provides reasonable evidence of effectiveness.

11.3. Recommendations for Future Research

Future research should employ longitudinal designs to assess writing skill retention over extended periods. Comparative studies examining ChatGPT effectiveness relative to other AI writing tools and conventional instruction would strengthen evidence. Research with larger, more diverse samples across Pakistani universities would enhance generalizability. Investigations of optimal scaffolding approaches—examining when and how ChatGPT support should be provided and withdrawn—would advance theoretical understanding and pedagogical practice. Finally, studies examining differential

effectiveness across proficiency levels, disciplines, and writing genres would inform targeted instructional design.

11.4. Final Remarks

As generative AI technologies become increasingly accessible, their thoughtful integration into ESL writing pedagogy holds transformative potential for addressing persistent writing challenges in Pakistani higher education and similar contexts worldwide. This study demonstrates that when systematically implemented with clear pedagogical scaffolding and ethical guidelines, ChatGPT can function as an effective digital tutor supporting students' academic writing development. The findings offer hope that AI-assisted instruction may help bridge the gap between traditional, resource-constrained teaching and the personalized, process-oriented writing support that ESL learners require to develop proficient academic writing skills.

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Appendices

Appendix A: Writing Assessment Rubric

Criterion	Excellent(21-25)	Good(16-20)	Satisfactory(11-160)	Needs Improvement (6-10)	Weak(0-5)
Grammatical Accuracy	No or few grammatical errors; accurate tense usage	Minor grammatical errors that don't impede meaning	Several grammatical errors occasionally impeding meaning	Frequent errors impeding	Pervasive errors preventing comprehension
Lexical Diversity	Wide vocabulary range; precise word choice	Good vocabulary with some variety	Adequate vocabulary with repetition	Limited vocabulary with frequent repetition	Very limited vocabulary
Coherence and Cohesion	Excellent logical flow; skillful transition use	Good organization ;appropriate transitions	Adequate organization; some transitions	Weak organization; few transitions	No clear organization
Content Development	Thorough topic development; strong supportive details	Good development and relevant details	Adequate development; some details	Limited development; few details	No development

Appendix B: Interview Protocol

1. Can you describe your experience using ChatGPT for your writing tasks?
2. In what ways, if any, did ChatGPT help you improve your writing?
3. What aspects of your writing do you think improved most?
4. Were there any challenges or difficulties you faced while using ChatGPT?
5. How did using ChatGPT affect your confidence in writing?
6. Did you have any concerns about using ChatGPT for academic writing?

7. Would you recommend ChatGPT to other students learning English writing? Why or why not?
8. What suggestions do you have for improving how ChatGPT is used in writing classes?