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Enhancing English Writing Proficiency in University EFL Learners through QuillBot: An Analysis of Reformulation, Clarity, and Lexical Advancement

By

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A thesis submitted to the Department of English and Modern Languages in partial fulfillment of the requirements for the degree of
MA in ELT

Department of English and Modern Languages
Independent University, Bangladesh
May, 2025

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Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Independent University, Bangladesh.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

Student's Full Name & Signature



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Approval

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Ethics Statement

In order to uphold the ethical principles of research, this study ensured the protection, dignity, and rights of all individuals involved. Before the commencement of data collection, informed consent was secured from each participant. This process included a comprehensive briefing on the study's objectives, methodological procedures, and the voluntary nature of their involvement. To maintain absolute confidentiality and anonymity, names and identifying details were replaced with codes to prevent any disclosure of personal information. The study design avoided any form of harm, pressure, or disadvantage to participants, ensuring fairness between the experimental and control groups. They were also assured that their data would be analyzed exclusively for academic purposes, with no personal information being shared with the AI platform beyond what was necessary for the writing tasks of the study.

This study incorporated several measures to ensure participant well-being and ethical conduct. To mitigate any potential disadvantage to the control group, they were granted access to the same AI resources as the experimental group upon the study's conclusion. Additionally, ethical approval was secured from the appropriate institutional review board, confirming that all procedures adhered to academic integrity and professional standards.

The study design was meticulously crafted to prevent any harm, pressure, or inequity between the experimental and control groups.

Abstract

Artificial Intelligence (AI) into education has reshaped approaches to language learning and writing development. This study investigates the role of AI tools, specifically QuillBot, in enhancing writing skills of English as a Foreign Language (EFL) university students. The research focuses on three core dimensions of writing improvement: Reformulation Proficiency, Clarity Optimization, and Lexical Advancement. A quasi-experimental design was employed with two groups: an experimental group that received AI-assisted writing support and a control group that engaged in traditional writing practices. Pretests and posttests were conducted to measure progress, and learners' perceptions were gathered through surveys categorized into six response scales. The study found statistically significant improvements in the experimental group across all three measured dimensions. An ANOVA analysis confirmed a strong interaction effect between group and time, indicating that students using QuillBot showed a superior ability to effectively reformulate sentences, enhance clarity in writing, and broaden their vocabulary compared to the control group. Furthermore, survey data revealed a generally positive reception among learners, with the highest approval ratings for reformulation proficiency, clarity optimization, and lexical Advancement. The findings from this research suggest that AI-driven writing tools are a valuable resource for EFL learners. By offering immediate feedback and opportunities for vocabulary enrichment, these tools effectively supplement traditional pedagogical approaches. The study's results point to the substantial pedagogical benefits of integrating AI into academic writing courses, though it also stresses the importance of maintaining a balance between tool reliance and the cultivation of critical thinking and creative expression.

Keywords: AI assistant, Writing Skills Development, EEL learners, Reformulation Proficiency, Clarity Optimization, Lexical Advancement.

Acknowledgement

First and foremost, I would like to begin by extending my profound gratitude to the Almighty for bestowing upon me the fortitude, perseverance, and resolve necessary to bring this endeavor to a success. This accomplishment would not have been attainable without divine providence. Thereafter, I would like to express my heartfelt appreciation to my parents and for their unwavering love, patience, and support, which provided me with the encouragement needed to accomplish this academic journey. It is a great honor to work under the guidance of my honorable supervisor **Dr. Naureen Rahnuma, PhD**, Head of the Department of English and Modern Languages School of Liberal Arts and Social Sciences, **Assistant Professor**, **Independent University of Bangladesh**. This study on **"Enhancing English Writing Proficiency in University EFL Learners through QuillBot: An Analysis of Reformulation, Clarity, and Lexical Advancement"** would not have been feasible with her invaluable mentorship, perceptive feedback, and unwavering encouragement were pivotal to the successful navigation of this research. Her sagacious counsel and scholarly acumen not only elevated the caliber of this study but also fostered my development as both a student and a scholar.

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List of Acronyms

AI	**A**rtificial **I**ntelligence
EFL	**E**nglish as a **F**oreign **L**anguage
NLP	**N**atural **L**anguage **P**rocessing
TAM	**T**echnology **A**cceptance **M**odels
AT	**A**ctivity **T**heory
HW	**H**yper **W**rite
TeSLA	**T**rust Based **e**-A**s**sessment **L**earning **A**pproach
EG	**E**xperimental **G**roup
CG	**C**ontrol **G**roup
RP	**R**eformulation **P**roficiency
CO	**C**larity **O**ptimization
LA	**L**exical Advancement
SSB	**S**um of **S**quares **B**etween
SSW	**S**um of **S**quares **W**ithin
MSB	**M**ean **S**quares **B**etween
MSW	**M**ean **S**quares **W**ithin

Chapter 1

Introduction

The growing connection of our world, AI tools are revolutionizing writing instruction for university EFL students. AI technologies like natural language processing (NLP) enable personalized learning experiences that cater to each students varied requirements. These tools provide instant feedback and customized improvement tips on writing assignments, promoting effective ideal setting for skill development. For EFL learners, AI-based Natural Language Processing tools are fundamentally changing how they develop their writing proficiency (Zhao, 2024). The immediate support offered by AI is important for EFL learners, getting real-time assistance is incredibly valuable for improving their writing techniques and overall language learning proficiency (Huang et al., 2023).

The role of AI tools extends beyond mere correction; they serve as interactive platforms that utilize AI driven algorithms can analyze a student's writing style, identify patterns, and suggest modifications that align with academic standards (Marzuki et al., 2023). This level of interactivity empowers learners to take ownership of their writing, transforming the often-daunting task of composition into a more manageable and enjoyable endeavor. Furthermore, these tools can simulate a peer review process, allowing students to critique their word and that of others, as a result, the integration of AI in writing education not only enhances linguistic capability but also nurtures essential skills that are vital in academic and professional contexts.

In light of these advancements, it becomes imperative to explore the implications of AI tools on the writing skills of EFL learners. This exploration entails examining the effectiveness of various AI applications, understanding their impact on learners' motivation, and assessing the challenges that may arise in their implementation (Mohammed & Khalid, 2025). By critically analyzing these dimensions, educators and stakeholders can better harness the potential of AI

technologies to create enriching learning experiences. Ultimately, the intersection of AI and language education presents a unique opportunity to redefine traditional pedagogical approaches, paving the way for a more dynamic and inclusive learning environment that meets the needs of diverse student populations.

1.1 Understanding EFL learners

Understanding English as a Foreign Language (EFL) learner's necessities a nuanced appreciation of their diverse backgrounds, motivations, and the challenges they faced in acquiring proficiency in a second language (Qassrawi & Al Karasneh, 2025), EFL learners often hail from varied linguistic and cultural environments, which profoundly influences their learning processes For instance, students whose first language employs a different script or grammar structure may encounter significant hurdles when grappling with English syntax and phonetics. These Learner not only master's vocabulary and grammar but also navigate expressions and cultural references that permeate the English language, which can be particularly daunting.

Moreover, the motivations of EFL learners are multifaceted and can range from personal aspirations, such as the desire to travel or connect with English-speaking peers, to professional goals, including the need for English proficiency in the global job market. This spectrum of motivation greatly impacts their engagement and persistence in language learning. For instance, learners motivated by intrinsic factors such as a genuine interest in English literature or culture, may exhibit higher levels of enthusiasm and commitment compared to those driven primarily by extrinsic incentives, such as passing exams or fulfilling academic requirements. Understanding these motivational dynamics is crucial for educators aiming to tailor their instructional approaches to better meet the needs of their students (Calafato, 2023; Teng et al., 2023).

Additionally, the role of technology, particularly AI tools, cannot be overlooked in the context of EFL learning. These tools provide Personalized learning experiences, allowing students to practice at their own pace and receive immediate feedback, which can significantly enhance their writing skills (Tamilselvi et al., 2023). However, the effectiveness of such tools is contingent upon learners' familiarity with technology and their willingness to engage with digital resources. As the landscape of language learning continues to evolve, recognizing the unique characteristics and needs of EFL learners will be essential in leveraging AI tools effectively to foster their writing abilities and overall language proficiency (Gayed et al., 2022).

1.2 Challenges Faced by EFL learners

EFL (English as a Foreign Language) learners encounter a myriad of challenges that can hinder their writing proficiency and overall language acquisition. One primary obstacle is the lack of foundational knowledge grammar and syntax, which often leads to difficulties in constructing coherent sentences. Many learners may struggle with verb tenses, prepositions, and subject-verb agreement, resulting in writing that is not only grammatically incorrect but also difficult for readers to understand. This foundation gap can create a cycle of frustration, where learners are hesitant to express their ideas in writing due to fear of making mistakes, ultimately stunting their development.

Another significant challenge is the limited exposure to authentic English writing style and genres. Many EFL learners are primarily taught through textbooks that may not adequately represent the diversity and richness of real-world English. Consequently, learners often find themselves unprepared for the various writing formats they encounter in academic contexts, such as research papers, essays, and reports. This lack of familiarity can lead to difficulties in adapting their writing to meet the expectations of different audiences and purposes, further exacerbating their anxiety and reluctance to engage in writing tasks (Li et al., 2024; Zhang et

al., 2024). Additionally, cultural differences in communication styles can complicate their writing processes, as learners may struggle to align their own culture norms with those of English-speaking contexts.

Furthermore, the psychological aspects of Learning a foreign language cannot be overlooked. Writing is a complex activity that involves psychological, motivational, metacognitive, and cognitive processes – cognition alone isn't sufficient to manage it (Hayes, 2012). Many EFL learners experience a lack of confidence in their writing abilities, often stemming from past experiences of negative feedback or criticism. This apprehension can result in avoidance behaviors, where learners shy away from writing assignments or fail to seek out constructive feedback. The pressure to perform well in a second language can also lead to heightened anxiety, which may inhibit creative expression and critical thinking in their writing. Addressing these challenges requires a multifaceted approach that not only focuses on language mechanics but also fosters a supportive learning environment that encourages risk-taking and self-expression. AI tools improve academic writing performance and reduce anxiety (Malik et al., 2023).

The primary objectives of this research:

1. To explore how AI tools influence EFL students' writing abilities

2. Understand the role AI tool as QuillBot play in shaping students' perceptions and involvement in writing tasks,

3. Analyze how students utilize feedback from AI tool QuillBot in their revisions.

1.3 AI tools for writing enhancement

The integration of Artificial intelligence (AI) tools in academic writing holds significant promise for enhancing the writing skills of university-level English as a Foreign Language (EFL) learners (Malik et al., 2023). Tools like Hyper Write aid users in quickly finding appropriate words, thereby streamlining the writing process. Similarly, OpenAI's ChatGPT serves as a sophisticated chatbot that effectively assists users by comprehending natural language input, thus facilitating tasks such as summarizing research findings, suggesting structural elements for academic papers, and even managing citations. Such tools can significantly reduce cognitive load for learners (Liu et al., 2023), allowing them to focus more efficiently on content creation and refinement, thereby improving their overall writing output (Aljuaid & others, 2024). Moreover, the increasing reliance on AI tools raises important pedagogical considerations, as outlined by several theoretical frameworks. Technology Acceptance Models (TAM) emphasizes the attitudes and perceptions of users toward AI adoption, indicating that positive experiences with AI tools can foster cognitive engagement among students. Additionally, Activity Theory (AT) provides insight into the social and cultural contexts of student interactions with these technologies. By understanding these interactions, educators can better facilitate the integration of tools into writing courses, enhancing the learning experience. Research has highlighted the effectiveness of specific applications like Grammarly, Jasper, QuillBot, which have demonstrated measurable improvements in writing quality, particularly in aspects such as content clarity and organizational structure. The current research examines the impact of artificial intelligence tools on writing proficiency of university students learning English as a foreign language (EFL). The study gives special attention to QuillBot, an AI-driven tool recognized for its paraphrasing and writing enhancement functionalities. (Baron et al., 2023) founded that to empower learners by offering grammar support and alternative phrasing, which allows them

more autonomy in revising their writing. Although a range of AI applications have been integrated into educational settings, including Grammarly and Turnitin, QuillBot has proven exceptionally advantageous for EFL learners. (Talapngoen & Thuratham, 2025) highlighted that its utility stems from a comprehensive suite of features, which includes grammar and stylistic correction, content paraphrasing and summarization, vocabulary expansion, and automated citation generation. Collectively, these functions are instrumental in refining writing accuracy and fostering a more sophisticated understanding of academic syntax, promotes ethical writing and, discourse conventions (Latifah et al., 2024). Among the many AI writing tools available, QuillBot stands out and is widely used by students, teachers, and researchers. Specifically, its paraphrasing tool provides a significant advantage for EFL learners by allowing them to reword sentences while preserving the original meaning and enhancing clarity. This functionality not only enriches students' vocabulary and introduces them to different sentence structures but also serves as a practical guide for avoiding plagiarism through proper rephrasing. (Rahmani, 2023) founded that Undergraduate student generally have a positive view of QuillBot, finding it easy to use and helpful for improving their writing. They also expressed that they would be willing to use it consistently. The standout quality of QuillBot is its multifaceted and adaptable design. It allows users to modify their text by selecting the desired formality, tone, and synonyms, or by switching between fluency and creativity. This gives users a more personalized approach to their writing, unlike other tools that apply uniform corrections. In addition to paraphrasing, QuillBot provides a range of other functions, including grammar checking, summarization, citation creation, and a thesaurus, establishing it as a versatile resource for improving writing. (Amyatun & Kholis, 2023) identify that it's a productive instrument for improving students' writing abilities. students found QuillBot to be a user-friendly and effective tool for improving their writing's structure and clarity. They also felt it helped them better understand academic English. However, like other

AI tools, QuillBot has its drawbacks. (Kurniati & Fithriani, 2022) commented that utilizing QuillBot there have three key benefits were anxiety reduction, convenient access and user-friendly features, and improved language acquisition.

Chapter 2

Literature Review

According to (Crystal, 2003), in the 21st century, English has been established itself as the foremost language for connecting internationally, scholarly conversations and advancing one's career. The study draws on a blend of cognitive and sociocultural theories are integrated to form the theoretical framework. Sociocultural Theory (Vygotsky), Lev Vygotsky developed his sociocultural theory, which is a foundational concept for social constructivist learning, primarily in the 1920s and early 1930s. This theory emphasizes the role of social interaction and cultural tools in cognitive development. AI tools can be seen as "mediating tools" or "cognitive tools" that mediate the learning process. They provide a scaffold for learners, allowing them to perform tasks that would otherwise be beyond their current capabilities (within their Zone of Proximal Development). For EFL students, AI tools can act as a knowledgeable "peer" or "tutor" that provides support and feedback, fostering independent learning and skill development. Academic writing, especially for EFL students, often involves a high cognitive load due to the simultaneous processing of grammar, vocabulary, content, organization, and rhetorical conventions. AI tools can significantly reduce extraneous cognitive load by handling lower-level tasks (e.g., grammar checks, spelling, basic paraphrasing). This frees up working memory for students to focus on higher-order thinking skills, such as developing arguments, structuring ideas, and engaging in critical analysis. According to (Zhao, 2024), grammar check, vocabulary, content do more than just fix mistakes; its crucial for learners to increase their sentence construction and achieve greater clarity. (Mohammed & Khalid, 2025) Says that the AI feedback points out instances of repeated or inappropriate word usage, encouraging learners to use a richer vocabulary. (Gibson et al., 2023) described, modern AI has brought forth powerful natural language processing tools, these tools offer a range of capabilities, including improved grammar checks, plagiarism detection that understands

context, highly accurate language translation, and the ability to summarize content based on its meaning. Examined by (Mudawy & Mohammed, 2024), AI writing assistants have gained considerable traction, drawing the attention of educators due to their multifaceted capabilities, which include not only grammar and tone checking but also research aid and content localization. This theory offers a direct explanation for why AI tools can make the writing process more efficient and effective. It allows researchers to investigate whether AI truly reduces cognitive burden and, consequently, improves the quality of learning and writing output. It also provides a lens to examine the potential pitfalls of over-reliance on AI, where students might offload too much and miss opportunities for genuine skill development.

Writing assistants and chatbots represent a transformative evolution in the writing process, particularly for English as a Foreign Language (EFL) learners at the university-level. These AI- driven tools offer functions that extend far beyond basic grammar and spell-checking, encompassing critical features such as research capabilities, tone adjustments, localization, and citation management. Hyper Write (HW) serves to enhance the writing experience by enabling users to find appropriate words swiftly, thus making the act of writing more efficiently. The specific capabilities of AI grammar and style checkers extend beyond mere error correction. As highlighted in the research by (Al-Garaady & Mahyoob, 2023), tools like ChatGPT excel in spotting a myriad of writing flaws, including issues with sentence structure, punctuation, and overall clarity. According to (Song & Song, 2023) explained that the implementation of AI-assisted writing tools, such as ChatGPT, enables learners to receive immediate, detailed feedback on various aspects of their writing, including coherence, grammar, and vocabulary usage. This capability addresses significant barriers faced by EFL students, like motivation constraints and time limitations, which can hinder their efforts to improve writing proficiency. Such automated analyses not only identify common grammatical errors, such as verb tense inconsistency and improper word use, but also provide insights into the stylistic aspects of

writing, such as tone and voice. This analytical approach enables educators to pinpoint the frequent challenges faced by EFL learners and to develop targeted instructional strategies that address these areas. By knowing where students struggle, teachers can create tailored curricula the foster improved language proficiency and writing abilities.

Developing strong writing skills is crucial for English as a Foreign Language (EFL) learners because it enables them to communicate clearly and express their ideas. Many studies indicate that AI tools can significantly boost EFL learners' writing abilities. For instance, (Marzuki et al., 2023) found that various AI writing tools like QuillBot, WordTune, Jenni, ChatGPT, Paperpal, Copy.ai, and Essay Writer positively improved students' overall writing quality.

Another AI tools (Syahnaz & Fithriani, 2023) highlighted that the use of QuillBot in English academic writing courses revealed effectiveness in improving the quality of their writing, minimizing grammatical errors, and improved language proficiency. (Al-Raimi et al., 2024), explained that these findings that AI tools such as QuillBot can be valuable for English as a Foreign Language (EFL) students struggling with academic writing.

In academic writing one crucial AI Plagiarism Detection tools play a critical role in maintaining academic integrity, specifically among EFL (English as a Foreign Language) learners at the university-level. These tools not only help identify instances of potential plagiarism but also Serve as educational aids that guide students toward better writing practices. According to (Zhao, 2024), AI-enhanced NLP (Natural Language Processing) tools have integrated plagiarism detection as a key feature. He also pointed out that modern AI writing software can detect plagiarism not just through exact word matches, but by analyzing the semantic meaning of text, allowing for the detection of nuanced similarities and ensuring originality. One notable system is the TeSLA (Trust Based Authentication & Authorship e-Assessment analysis) tool, developed in collaboration with various researchers and institutions

as part of an EU-funded project. TeSLA evaluates the originally of submitted texts at the point of submission, offering immediate feedback on the level of plagiarism detected. (Edwards et al., 2018) pointed that while it is essential to not that Plagiarism detection algorithms may not specify the exact categories of plagiarism, they help educators gauge the likelihood of academic misconduct, enabling informed responses tailored to the individual learner's needs.

The potential impact of AI chatbots on EFL writing is further amplified by there ability to provide immediate feedback, a crucial element in the learning process. Research by (Pitychoutis, 2024) has been shown that learners benefit significantly from promote responses regarding their writing, which enhances accuracy and encourages greater engagement with writing tasks. Chatbots can offer personalized learning paths by evaluating a student's proficiency level and tailoring feedback accordingly, making them and invaluable resource in EFL settings. They not only assist in constructing essays but also create a supportive environment that alleviates anxiety associated with language learning. By providing a low-stakes platform for practice, students are more likely to experiment with language without the fear of negative evaluation, which can improve their writing competence over time.

Research Question:

1. How do university students learning English as a Foreign Language (EFL) incorporate AI technologies into their writing processes?

2. Does regular use of AI writing tool particularly QuillBot results in sustained improvement in writing skills?

3. when it comes to the writing development, is QuillBot has had support learners understanding of writing conventions?

Chapter 3

Research Methodology and Ethics

3.1 Participants

The research conducted a mixed-methods to comprehensively examine how AI tools influence the writing skills development of EFL university students. It took place at a private university in Bangladesh. Which lasted from one semester of undergraduate ELT students. Quantitatively, A quasi-experimental design, structured with a pretest and posttest and randomized allocation, was deployed to probe the effects of AI-enhanced Natural Language Processing tools on writing competence, involving three experimental contingents and a control group. (Taşkıran, 2022) Called for deeper exploration of NLP-powered tools that can handle writing tasks beyond evaluation, such as idea generation and summarization. this design measured improvements in writing skills from their real experience on using AI tools. Qualitatively, Focus Group Interview provided insights of the studies to utilize the use of AI tools into learners' perceptions and their practical experience in writing skills. EFL undergraduate design 109 students. The participants were divided into three group. The subsequent text offers a comprehensive overview of the participants below: Age: Encompassing individuals aged (18 to 25). English proficiency level: All individuals had possessed an intermediate-level competency in English. The methodology leveraged a convenience sample of readily available and willing participants. The research conformed in strict adherence to ethical principles, by upholding participant informed consent confidentiality. The anomalous data points were during the homogenization of the sample. The study involved three experimental groups and one control group, with the primary objective of examining the influence of principles such as reformulation proficiency, clarity optimization,

and lexical advancement. A randomized pretest-posttest experimental design was employed to assess the impact of AI-enhanced Natural Language Processing Tools on writing proficiency.

3.2 Instruments

Reformulation Proficiency

The present study evaluated a pretest-posttest methodology to gauge the impact of a assistance on the development of English writing skills among university level learners on reformulation proficiency. In the initial, the pretest required students to paraphrase short academy texts without the aid of any AI tools their responses were then assessed fidelity of meaning, grammatical integrity, and diverse range of vocabulary. This initial assessment established a baseline of the learner's independence reformulation abilities. Reformulation is the capacity of learners effectively rephrase or reconstruct sentences while preserving the original meaning and adhering to academic conventions. For students of English as a Foreign Language (EFL), this competence is vital for writing enhancement because it signifies their grasp of the material, promotes intellectual honesty, and minimizes the risk of plagiarism. Rather than a mere lexical substitution, reformulation proficiency is an advanced writing competence that necessitates a blend of grammatical mastery, lexical dexterity, and an understanding of discourse structure. Following a period of using QuillBot as a paraphrasing and rewriting tool for writing improvement, a posttest with comparable passages was administered. Students were expected to demonstrate the newly acquired linguistic awareness and strategic skills, even without the aid of the tool. The analysis of pre- and posttest results was instrumental in assessing whether exposure to QuillBot enhanced learners' ability to reformulate texts with greater accuracy, fluency, and lexical richness.

Clarity Optimization

The ability to express ideas in a precise, direct, and readily understandable way is known as clarity optimization. Within scholarly writing, this skill is vital for communicating arguments, evidence, and analysis without any vagueness, enabling readers to quickly comprehend the writer's message. English as a Foreign Language (EFL) students frequently face difficulties achieving this due to their limited vocabulary, grammatical challenges, and inclination to use excessively complex or redundant sentence structures. Therefore, clarity optimization is an essential competency for developing robust writing. In the present study, clarity optimization is measured using a pretest–posttest design to evaluate the impact of QuillBot on students' writing. During the pretest, students were asked to write a short reflective journal or passage summarizing a given text. This initial test provided a baseline for students' independent clarity in writing. After the intervention period, in which QuillBot was integrated into students' writing practice, a posttest was administered with a comparable writing task. In this stage, students were expected to demonstrate improvements in clarity by producing more concise and logically structured texts, reflecting the strategies they had observed and practiced with the tool. The results of the pretest and posttest were compared to determine whether QuillBot's features, such as paraphrasing, sentence restructuring, and vocabulary refinement, contributed to measurable improvements in clarity optimization. Through this design, the study not only identifies learners' initial challenges in achieving clarity but also investigates whether exposure to AI-driven suggestions can enhance their independent ability to write with precision. Clarity optimization, therefore, functions as both a measurable outcome and an essential dimension of writing proficiency for EFL learners.

Lexical Advancement

Lexical Advancement is considered as one of the key outcomes of integrating QuillBot into writing instruction. QuillBot's synonym generation, word substitution, and paraphrasing functions expose learners to a wider range of lexical alternatives, helping them move beyond simple vocabulary to more nuanced and discipline-appropriate expressions. For example, a student who repeatedly uses "important" can be guided toward more precise alternatives such as "crucial," "significant," or "fundamental," depending on the context. This process supports learners in recognizing the subtle distinctions in meaning and tone that are critical in communication. To measure progress, lexical advancement is incorporated into a pretest–posttest design. In the pretest, learners complete a writing task that is analyzed for vocabulary range, appropriateness, and avoidance of redundancy. During the intervention, students use QuillBot as a support tool for revising and enriching their drafts. In the posttest, learners complete a comparable writing task without assistance, demonstrating whether their exposure to lexical alternatives translates into independent lexical sophistication. Ultimately, lexical advancement contributes to stronger writing skills by making texts more precise, persuasive, and professional. As learners develop this competence, they not only expand their vocabulary but also improve their ability to choose the right word in the right context.

3.3 Data collection procedures learning

The Data collection instruments was conducted using a combination of methods, specifically reformulation proficiency, clarity optimization, lexical advancement, and Focus Group interview. Using a quantitative and qualitative research method. This study explore how AI tools play a pivotal role to nurture writing of students learning English as a foreign language (EFL), focusing on their personal perspectives, adhered to all procedures to ensure its methods and data analysis possessed qualified measurement properties and were aligned with the

study's objectives. The EG participated in an online writing development program where they received immediate, personalized, AI-generated feedback on their assignments, which focused on grammar, vocabulary, and coherence. The CG completed the same writing activities but did not receive this AI-generated feedback. Instead, their feedback was delayed and came from the instructor. The quantitative phase of the study collected pretest and posttest data from both the experimental group (EG) and the control group (CG). At the start of the study, participants in both groups completed three initial assessments: Reformulation Proficiency (RP), Clarity Optimization (CO), and, Lexical advancement (LA). After the intervention, the same three instruments were administered as posttests to assess changes in the measured variables. The resulting data were statistically analyzed using ANCOVA and independent sample t-tests to compare outcomes within each group and between the experimental and control groups. The advent of emerging technology particularly artificial intelligence AI tools, the study employed Focus Group interview it is a semester qualitative instrument design to collect in depth insights into EFL students' perception, challenges, and strategies in writing enhancement. The data can be used to cross reference and strength findings from academic writing and observation (Saunders et al., 2023). The data collected through Interviews were conducted with three groups, The groups were formed based on the participants' academic writing performance, categorized (high, middle, and low) over the semester. Interview protocol was meticulously structured and curated, with questions that focused on writing experiences to elicit diverse viewpoints. The questions reiterated key themes to facilitate an in-depth exploration of the data and effectively address the research objectives. The participants were stratified into three groups based on their writing performance. The high-achieving cohort comprised students who demonstrated the most significant improvement in their scores. Conversely, the low-performing group consisted of students with the most minimal score improvements, while the intermediate-performing group included those who achieved moderate progress. To promote a

free exchange of participant ideas and insights, an open-ended interview format was created to capture their views on the educational intervention's effectiveness. The interviews for the experimental groups were guided by ten carefully designed questions, tailored to each specific condition (Group 1, Group 2, and Group 3). To ensure a thorough evaluation of the intervention's impact, two independent rates coded the interview data, which helped to triangulate the findings with the questionnaire responses. A quantitative summary was then prepared by systematically coding the responses into six categories: 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), 5 (Strongly Agree), and 6 (Not Applicable). This process enabled a detailed analysis of the insights, offering valuable perspectives on the participants' experiences with the intervention.

3.4 Focus group interview

To gather detailed qualitative data, we utilized a Focus Group Discussion (FGD), a method perfect for uncovering participants' in-depth feelings and experiences. Specifically, this study conducted the FGD to explore how EFL university students perceive the influence of the AI-assisted tool, QuillBot, on their writing development. Through this interactive session, students were able to openly share their opinions, discuss their writing challenges and successes, and collectively assess how AI technology shaped their learning.

A semi-structured group discussion was held with six to eight participants from the experimental group who had been using QuillBot throughout the study. Instead of seeking rigid answers, the session was guided by open-ended questions designed to foster an interactive dialogue. The conversation centred on three main areas linked to the research goals: participants' experiences with Reformulation Proficiency, their perception of how well Clarity Optimization improved their work, and how Lexical advancement influenced their vocabulary use and overall confidence in writing.

The focus group discussion (FGD) was designed to be relaxed and non-judgmental, making sure everyone felt comfortable enough to share their most honest opinions. The researcher's role was to facilitate the conversation, encouraging balanced participation so that every voice got a chance to be heard. Each session ran for about 45 to 60 minutes and was audio-recorded with the participants' permission. To enrich the interpretation, field notes were also taken to document non-verbal cues like tone, gestures, and how the group interacted.

Once the sessions were finished, the recordings were fully transcribed and then explored using thematic analysis. The main findings immediately fell into specific subtopics: the utility of AI in reducing mistakes, a growing assurance in rephrasing their writing, noticeable improvements in clarity and flow, and the enrichment of vocabulary terminology. Ultimately, this process revealed common patterns and shared experiences across the group while still acknowledging what made each participant's experience unique.

Ethics were paramount throughout the entire study. And guaranteed confidentiality to all participants, using pseudonyms when sharing the results. Crucially, the focus group data didn't just stand alone; it enriched and expanded on the quantitative results, providing deep, personal understanding of how the learners truly experienced the AI tools.

3.5 Data analysis

The results were analyzed in a three-step process. First, the individual group analysis examined the pre-test and post-test results for each group, focusing on how often and how well they used skills like reformulation proficiency, clarity optimization, and lexical advancement. Next, in-group comparison compared the results of the two groups against each other at both the pre-test and post-test stages. Finally, the within-group comparison looked at the changes within each individual group by comparing their pre-test scores to their post-test scores. To

evaluate each experimental group's performance across key metrics as reformulation proficiency, clarity optimization, and lexical advancement. This analysis employed descriptive statistics, including means and standard deviations, to investigate the influence of AI-enhanced tools on writing skills, a comprehensive analysis of pre- and post-test assessment data and feedback questionnaires was performed. To address participants' overall perspectives on the usability, influence, and effectiveness of AI tools, here calculated the mean scores and standard deviations for each perception statement. A qualitative analysis of open-ended interview responses was also conducted to gain deeper insights into participants. Statistical analyses, including ANOVA and t-tests, were utilized to evaluate the significance of improvements in writing proficiency across the experimental and control groups. Further subgroup analyses investigated whether specific types of AI technology influenced the observed improvements. a mixed-methods approach was adopted to analyze learners' perceptions of the effectiveness of the AI-enhanced tools. Data from structured questionnaires and open-ended interviews were systematically analyzed to understand user feedback.

Table 1 shows that a detailed rubric was used to asses fidelity of meaning, coherence, grammatical integrity, and vocabulary:

Table 1: Pre-tests and Post-tests rubric of the writing.

Category	Description	Score range
Fidelity of meaning	Rewrite sentences without changing their meaning	0-5
Coherence	Logically connected and effectively organized.	0-5
Grammatical integrity	The correctness of syntactic construction and standard punctuation is paramount.	0-5
Vocabulary	The appropriateness and diversity of the vocabulary employed	0-5

Chapter 4

Results Analysis and Findings

4.1 Quantitative data analysis

The research employed a quasi-experimental pretest-posttest methodology to assess the impact of utilizing AI-driven Natural Language Processing (NLP) instruments on the writing competence of students learning English as a Foreign Language (EFL). A total of 109 tertiary-level participants were allocated into four distinct groups: three intervention (experimental) groups and one control group. Each experimental group was exposed to a unique AI intervention: Group 1 utilized tools for grammar and vocabulary refinement (focused on language accuracy); Group 2 employed AI for summarizing content; and Group 3 engaged with AI tools supporting creative composition. The control group followed a conventional curriculum devoid of AI assistance. Due to the quasi-experimental nature of the study, full randomization was limited. Participants were selected using convenience sampling from readily available EFL programs. Instead of individual randomization, whole classes were assigned to either the experimental or control group based on logistical ease. While this preserved the natural classroom environment, it restricted randomization. To balance the four resulting groups, a random-number generator was used to allocate students equally. This allocation method successfully balanced key demographics (proficiency, gender, and major), thereby reducing selection bias while maintaining ecological validity. Acting as the essential point of comparison, the control group's purpose was to accurately gauge the effect of the AI tools. Their instruction was entirely traditional, utilizing common classroom practices such as detailed grammar lessons, vocabulary practice, editing with peers, and instructor comments. Though they matched the experimental groups by executing the same writing tasks, studying the same content, and spending an equivalent amount of time in instruction, the control group

never used AI-assisted technologies. This uniformity ensured that any discrepancies in performance could be definitively linked to the introduction of AI rather than unrelated factors like curriculum or time differences.

The “pilot experimental” construct, denotes the authentic, practical application of Artificial Intelligence (AI) tools within typical instructional environments. This concept was operationalized by observing learners’ direct engagement with AI platforms while undertaking genuine writing assignments, including but not limited to essays, summaries, and creative compositions. The methodology involved students utilizing AI-generated feedback, subsequently revising their manuscripts, and providing reflective data via interviews and questionnaires. This design choice enhanced ecological validity by simulating authentic writing practices, contrasting with constrained, laboratory-based tasks. Consequently, this operational approach effectively illustrates the potential for meaningful integration of AI-driven Natural Language Processing (NLP) tools into daily educational contexts, providing learners with realistic, interactive, and context-specific writing experiences.

4.2 Results

This section presents and analyzes the findings concerning the primary research objectives. These objectives include identifying the skills and domains within EFL students' writing improvement through AI tool particularly QuillBot. A comprehensive examination of the data presented in tables presents a detailed analysis of descriptive statistics for Reformulation Proficiency (RP), Clarity Optimization (CO), and Lexical Advancement (LA) across several treatment groups and a control group.

Table 1 presents a detailed analysis of descriptive statistics for Reformulation Proficiency (RP), Clarity Optimization (CO), and Lexical Advancement (LA) across several treatment groups and a control group. The subsequent discussion highlights key insights and findings, particularly emphasizing the performance of Group 1. In the reformulation proficiency Pretest, the mean scores for the treatment groups ranged from 27.10 to 28.49, with minor variations in standard deviations. Notably, Group 1 (Reformulation Proficiency improvement) achieved a mean score of 29.15, demonstrating a slightly higher level of accuracy in reformulation proficiency compared to the other groups. Group 1 (Reformulation Proficiency improvement) achieved a notably high mean score of 29.15 on the pretest, demonstrating a higher level of language accuracy than the other groups. The confidence intervals indicate significant differences in the pretest scores among the groups, highlighting Group 1's unique characteristics and effectiveness. On the reformulation proficiency Posttest, significant mean differences were observed between the treatment groups, with Group 1 scoring a mean of 69.01, which was considerably higher than the other groups. The large mean difference of 14.849 between Group 1 and Group 2 further underscores the important impact of the Reformulation proficiency improvement treatment on posttest scores, affirming Group 1's crucial role in achieving substantial improvements in reformulation proficiency. Descriptive analysis of the Clarity Optimization Pretest and Posttest data shows consistent mean scores for

the treatment groups at both assessment points. Group 2 exhibited a clear advantage in clarity Optimization, as indicated by its mean scores of 34.34 on the Pretest and 56.38 on the Posttest, surpassing the performance of its counterparts. The Lexical Advancement Pretest and Posttest results showed a range of mean scores from 27.01 to 26.73 and 44.96 to 65.12, respectively, across the treatment groups. Group 1's performance was particularly strong, with a mean score of 65.12 on the Lexical Advancement Posttest, suggesting it had a pronounced impact on Lexical Advancement outcomes.

Table 2: Descriptive statistics for Reformulation Proficiency, Clarity Optimization, and Lexical Advancement Across Group

Descriptive							
	Source	N	Mean	Std. Deviation	Std. Error	Min	Max
Reformulation Proficiency Pretest	Group-1	25	29.15	6.159	1.231	18	38
	Group-2	26	27.26	6.508	1.276	18	38
	Group-3	29	27.10	5.433	1.009	18	38
	Control Group	29	28.49	6.869	1.275	18	38
	Total	109					
Reformulation Proficiency Posttest	Group-1	25	69	5.784	1.156	60	80
	Group-2	26	55	7.301	1.432	44	66
	Group-3	29	62.27	4.813	0.893	55	70
	Control Group	29	26.41	6.184	1.148	18	80
	Total	109					
Clarity Optimization Pretest	Group-1	25	33.96	7.202	1.440	20	45
	Group-2	26	34.346	6.945	1.362	20	45
	Group-3	29	33.72	6.855	1.272	20	45
	Control Group	29	37.10	5.765	1.070	20	45
	Total	109					
Clarity Optimization Posttest	Group-1	25	79.4	5.642	1.128	70	90
	Group-2	26	59.38	6.468	1.268	50	70
	Group-3	29	79.82	6.930	1.286	65	88
	Control Group	29	32.55	67.697	1.429	20	45
	Total	109					

Descriptive							
	Source	N	Mean	Std. Deviation	Std. Error	Min	Max
Lexical Advancement Pretest	Group-1	25	27	6.538	1.307	15	35
	Group-2	26	26.73	5.751	1.127	15	35
	Group-3	29	25.34	6.090	1.130	15	35
	Control Group	29	26	6.516	1.210	15	35
	Total	109					
Lexical Advancement Posttest	Group-1	25	65.12	6.209	1.241	55	75
	Group-2	26	44.96	8.225	1.613	35	55
	Group-3	29	53.58	7.547	1.401	45	65
	Control Group	29	25.10	6.427	1.1935	15	35
	Total	109					

As presented in Table 2, the results of the ANOVA analysis for three distinct variables—Reformulation proficiency, Clarity Optimization, and Lexical Advancement—are displayed, indicating whether the mean scores for these variables vary significantly across the different groups. This table provides the F-statistic, which is used to determine if the null hypothesis (that all group means are equal) should be rejected in favor of the alternative hypothesis (that at least one group mean is different). ANOVA, or Analysis of Variance, is a statistical method used to determine if there are any statistically significant differences between the means of three or more independent groups. The technique works by partitioning the total variability in a dataset into two primary components: the between-group variance, which accounts for the differences between the group means, and the within-group variance, which reflects the variability of scores within each independent group. By comparing these two types of variances, ANOVA assesses whether the observed differences between group means are likely due to chance or if at least one group mean is significantly different from the others.

Table 3: ANOVA results for Reformulation Proficiency, Clarity Optimization, and Lexical Advancement

ANOVA					
		Sum of square	df	Mean square	F
Reformulation Proficiency Pretest	Between Groups	77.753	3	25.918	0.661
	Within Groups	4116.765	105	39.207	
	Total	4194.518	108		
Reformulation Proficiency Posttest	Between Groups	29520.114	3	9840.038	268.026
	Within Groups	3854.916	105	36.713	
	Total	33375.03	108		
Clarity Optimization Pretest	Between Groups	211.098	3	70.366	1.573
	Within Groups	4697.010	105	44.733	
	Total	4908.108	108		
Clarity Optimization Posttest	Between Groups	42128.390	3	14042.797	3.294
	Within Groups	447514.827	105	4262.046	
	Total	489643.217	108		
Lexical Advancement Pretest	Between Groups	45.939	3	15.313	0.394
	Within Groups	4080.039	105	38.857	
	Total	4125.978	108		
Lexical Advancement Posttest	Between Groups	23501.623	3	7833.874	153.235
	Within Groups	5367.885	105	51.123	
	Total	28869.508	108		

The analysis reveals a considerable difference between the group means, as shown by the Between-Groups Sum of Squares (SSB) of 29520.114. This large value suggests that the AI-enhanced tools had a significant impact on Reformulation Proficiency. The Within-Groups Sum of Squares (SSW), 4116.765, reflects the variability of scores within each group. The Mean Squares Between (MSB) and Mean Squares Within (MSW) are 25.918 and 39.207, respectively, with the larger MSW value indicating that the average variance within each group is substantially greater than the average variance between the group means.

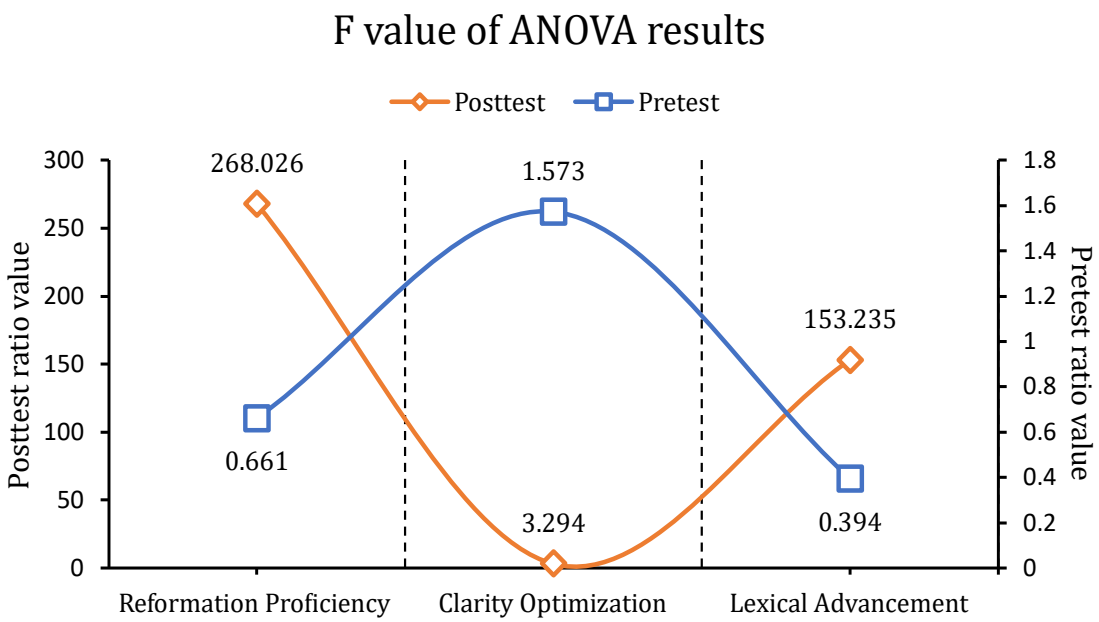


Figure 1: F value of ANOVA results for Pretest and Posttest

For example, In Figure 1 during the pretest, the F-value was notably low at 0.661. This low value suggests that the variance between groups was not significantly greater than the variance within groups. Consequently, this indicates that the AI assistant, QuillBot, did not have a significant effect on reformulation proficiency at the pretest stage, and there were no significant differences in reformulation between the groups. In contrast, the posttest yielded a substantially high F-value of 268.026. This high F-value signifies a pronounced difference between the group means, indicating that the AI-enhanced groups achieved significant improvements in reformulation proficiency. Essentially, a high F-value points to a strong, significant difference between group means, while a low F-value suggests the absence of such a difference. The data from this study align with this principle, showing no significant difference in the pretest and a highly significant difference in the posttest. The results has shown in Figure1 from the ANOVA, as detailed in Table 2, provide substantial evidence regarding the influence of different treatment groups on student performance in reformulation proficiency, clarity optimization, and lexical Advancement. Specifically, Group 1 intervention was highly

effective in improving reformulation proficiency, suggesting that certain interventions have a more pronounced and specific effect on learners' outcomes.

Based on the survey results, in Table 3 students generally hold a positive view of QuillBot's ability to improve their writing proficiency. The findings indicate that the tool is effective in three key areas are reformulation proficiency, clarity optimization, and lexical advancement. The data presented in the table further supports this, showing that most participants either agreed or strongly agreed that using AI assistance enhanced their writing skills. For reformulation proficiency, the majority of learners (65.5%) reported positive perceptions, indicating that QuillBot effectively aided them in restructuring sentences, eliminating redundancy, and enhancing overall fluency.

Table 4: Learner's Perception improve writing skills with AI assistance QuillBot

Perception	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Reformulation Proficiency	65.5%	16.5%	10%	4.5%	3.5%
Clarity Optimization	51.6%	20.4%	15%	8%	5%
Lexical Advancement	62.8%	20%	12.2%	3%	2%

A small proportion of participants (4.5%) expressed negative views, and 10% remained neutral. These findings suggest that students largely acknowledge the tool's contribution to improving reformulation skills, though a minority may still favor conventional methods. The Clarity Optimization category received a slightly lower positive response rate of 51.6% from learners. This suggests that while QuillBot was perceived as effective for enhancing coherence, flow, and readability by a significant number of students, a notable proportion held neutral or negative views.

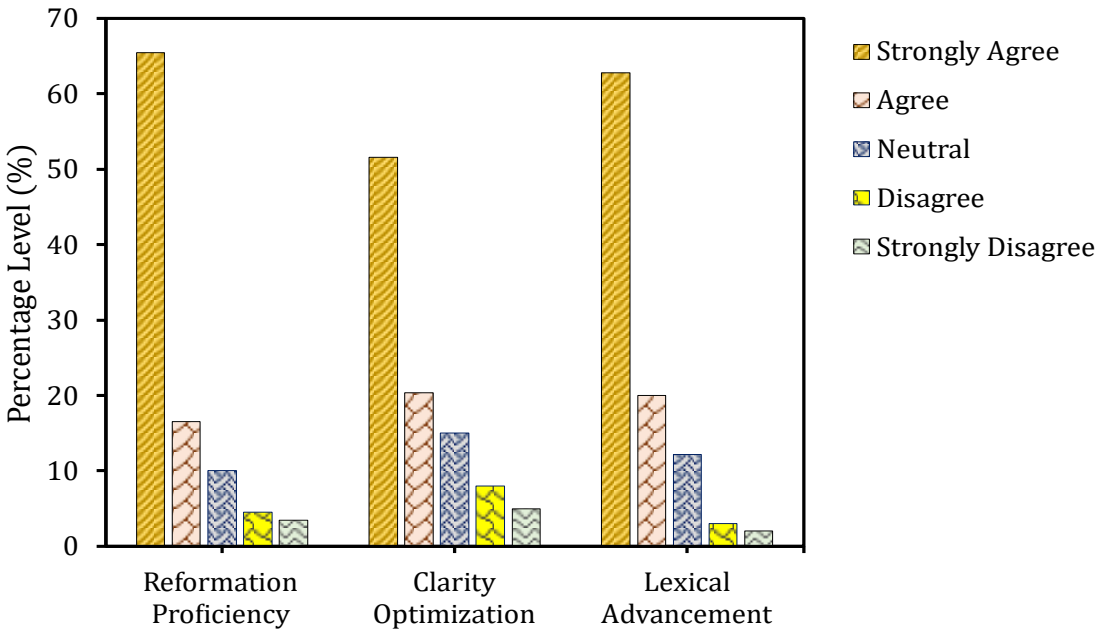


Figure 2: Improvement level of AI assistance QuillBot for writing skills in learning perception

Possible explanations for this finding include students' apprehensions regarding over-reliance on AI technology and the difficulty of preserving originality during the process of clarity optimization. The Lexical Advancement feature received also the positive feedback, with 62.8% of participants agreeing that it expanded their vocabulary and improved word precision. This demonstrates that students value AI tools for improving their lexical range, that has shown Figure 2, which is a key aspect of writing improvement. Overall, the findings suggest that students view QuillBot as a valuable tool for supporting writing development, particularly for improving lexical variety and reformulation, though its effectiveness in enhancing clarity is perceived more variably.

4.3 Qualitative data analysis

Semi-structured interviews were employed to collect qualitative data from 21 student participants, representing both the experimental and control cohorts. This sample size of 21 was reached because it achieved data saturation. The interviews explored several areas, including students' opinions on AI-generated feedback, any changes they experienced in their writing styles, and the influence of the feedback on improving their writing. The analysis process began with the full transcription of the interviews. The study developed initial codes from data segments relevant to the study, which were later consolidated into major themes. For example:

Theme 1: Increase writing confidence and reduced cognitive load

Theme 2: Enhanced clarity and coherence awareness

Theme 3: Expanded lexical control and precision

Following the initial coding, the research grouped the data into major themes. These themes were then carefully validated against the original participant responses to ensure accuracy. Subsequently, the validated themes formed the foundation of the final analysis, which clarifies the role of each theme in understanding AI-generated feedback's impact on EFL learners. Participant quotes were also incorporated throughout the results to directly illustrate their perspectives.

The semi-structured interviews with EFL learners (from both the Experimental Group and Control Group) offered valuable qualitative insights into how AI- assistant feedback impacted their writing. A thematic analysis of these interviews ultimately revealed three key themes, which are detailed below.

Increase writing confidence and reduced cognitive load

Participants from the EG reported increased confidence due to the personalized and consistent nature of AI-generated feedback. Students emphasized that feedback focusing on advanced writing competence that necessitates a blend of grammatical mastery, lexical dexterity, and an understanding of discourse structure, encouraged them to improve their writing skills more actively. They felt motivated to revise and improve because the AI feedback was immediate and focused on areas for improvement rather than just providing general comments.

Student 1 (EG): "QuillBot helped me rewrite my ideas more clearly without losing what I wanted to say."

Student 2 (EG): "Before using AI, I struggled to reformulate ideas, but the tool showed me several clearer options instantly."

Student 3 (EG): "Rewriting paragraphs became easier because the AI gave me structures, I could learn from."

Student 4 (EG): "Using QuillBot made my sentences flow better, especially when I tried to express complex concepts."

Student 5 (EG): "For my assignment, I used QuillBot's suggestions to improve clarity, and it genuinely changed how I see writing proficiency."

Student 6 (EG): " The tool helped me adopt a more academic tone by suggesting more formal expressions."

In contrast, participants from the CG expressed a desire for more consistent feedback and reported that the lack of immediate and detailed responses affected their enthusiasm to revise their work.

Student 7 (EG): "I struggled to rewrite sentences because I wasn't always sure how to change them without changing the meaning."

Student 8 (EG): " Sometimes my paraphrases changed the meaning, and I didn't notice until the teacher pointed it out."

Enhanced clarity and coherence awareness

A noticeable number of students achieved greater sentence clarity and flow. They often highlighted Quill Bot's ability to present multiple structural variations, enabling them to

compare alternatives and select the most effective phrasing. The immediate, AI-driven reformulations essentially served as a source of constant feedback, thereby strengthening the learners' capacity to critically assess their own writing for clarity—a clear advantage over traditional classroom writing methods.

Student 9 (EG): "Seeing how the tool simplified my sentences taught me how to make my writing more direct and understandable."

Student 10 (EG): "AI helped me notice how many unnecessary words I usually add, so my writing became much clearer."

Student 11 (EG): "With QuillBot, I spent more time thinking about ideas and less time struggling with sentence construction."

Student 12 (EG): " QuillBot made my writing flow better, especially when connecting ideas across sentences."

Student 13 (EG): "I wasn't always sure what writing style should look like without example."

Student 14 (EG): " I spent too much time trying to fix sentences, so I couldn't work on improving structure."

On the other hand, CG learners mentioned a higher level of anxiety during the writing process, particularly when waiting for human feedback.

Student 15 (EG): " My sentences felt disconnected, and I wasn't confident how to make them clearer."

Student 16 (EG): " I found it difficult to maintain coherence, especially in longer paragraphs."

Expanded lexical control and precision

A major takeaway from the experimental group (EG) discussions was that engaging with AI-generated feedback primarily benefited participants through improved vocabulary. Learners often indicated that the AI's capacity to deliver varied synonyms, tone modifications, and

strategic word choices was instrumental in boosting their lexical precision and overall vocabulary awareness.

Student 17 (EG): "The vocabulary choices offered by QuillBot helped me replace basic words with more academic ones."

Student 18 (EG): "I learned new synonyms just by comparing the AI's suggestions with my original words."

Student 19 (EG): "Using QuillBot made my assignment-writing more efficient because it showed me better vocabulary options."

Student 20 (EG): "My writing sounds more academic now because the AI expanded my range of word choices."

Conversely, students in the CG group reported difficulty in assessing their development due to the absence of regular feedback, resulting in a diminished sense of control over their educational process.

Student 21 (EG): " My assignment lacked vocabulary variety because I mainly used the words I already knew."

Chapter 5

Discussion, Conclusion, Limitations and Recommendations

5.1 Discussion

The objective of this research was to explore the impact of AI tools, with a specific focus on QuillBot, on writing proficiency of EFL university students. The analysis, which utilized both quantitative and qualitative methods, yielded robust evidence that AI assistance substantially enhances student performance in key areas: reformulation proficiency, clarity, and lexical enrichment. This discussion chapter is dedicated to the interpretation of these findings, their integration with established scholarly literature, and the identification of pedagogical implications, associated challenges, and future research trajectories. A key finding from this study was the considerable improvement in students' reformulation proficiency, which was evident in their posttest scores and personal reflections. Paraphrasing is often a challenge for English as a Foreign Language (EFL) students, yet it's essential for preventing plagiarism and showing a deep understanding of writing texts. The study showed that with the help of AI, students were better able to rephrase sentences and express ideas in their own words. Additionally, students reported that using a tool like QuillBot helped them recognize different ways to phrase things, which acted as a subtle form of instruction. Therefore, using AI for paraphrasing not only led to immediate gains but also helped students develop skills that they could apply to their writing in the long term. The study also revealed significant gains in clarity optimization. Students' writing after the intervention showed improved logical flow, reduced redundancy, and stronger coherence between ideas. This improvement resonates with previous findings that AI feedback systems can foster better text organization. Participants reported that QuillBot's suggestions encouraged them to pay attention to transitions, sentence length, and audience comprehension. Importantly, clarity improvements went beyond surface-level

corrections; students developed greater awareness of rhetorical effectiveness. The implications here are pedagogical as well: AI can function as a complementary tool that provides instant feedback on coherence, thereby freeing instructors to focus on higher-order issues like argumentation and critical thinking. Another significant contribution of AI assistance was lexical advancement. Learners' posttest writing assessments showed increased use of precise, context-appropriate vocabulary and stylistic variation. These findings are consistent with prior research indicating that exposure to AI-generated lexical alternatives helps students expand their repertoire of writing. From a pedagogical perspective, lexical advancement is particularly important for EFL learners who tend to overuse limited vocabulary. By providing synonyms, collocations, and stylistically diverse options, AI tools encourage learners to experiment and refine their linguistic choices, thereby strengthening their writing skills. In addition to the measurable writing outcomes, qualitative results highlighted affective benefits such as increased confidence and reduced writing anxiety. Students described AI tools as a supportive resource that made writing tasks less intimidating. AI-driven scaffolding can improve learner motivation by reducing cognitive overload. In this study, AI tools acted not as replacements for student effort but as partners in the learning process, providing reassurance and immediate feedback that promoted greater risk-taking in writing. However, the use of these tools isn't without its challenges. Some students worried they might become too dependent on AI, which could hinder their ability to learn new vocabulary or think critically about language on their own. Others noted that the AI's suggestions sometimes changed the original meaning of their work. These issues show that students need to be taught how to use AI tools thoughtfully and strategically. Additionally, while AI is great for improving grammar and style, it can't replace the need for an instructor to help with higher-level skills like critical analysis and original thought. The findings of this study have substantial implications for the field of EFL writing instruction. The first key takeaway is that AI tools can be effectively integrated into a classroom

setting as supplemental aids for enhancing writing quality, particularly in areas of reformulation, clarity, and lexical. Second, educators should stress the importance of students critically engaging with AI-generated content to prevent a passive reliance on these tools. The research also suggests two avenues for future investigation: a longitudinal study to determine if skills developed with AI assistance transfer to independent writing tasks, and a comparative analysis of different AI tools to better understand their unique capabilities and limitations. In this study, the findings reveal that artificial intelligence writing assistants, such as QuillBot, can substantially improve writing proficiency of students of English as a foreign language (EFL). The results confirm notable gains in students' reformulation skills, clarity of expression, and lexical development. Although the study demonstrates the cognitive and affective advantages of AI integration, it also underscores the critical need for responsible and guided implementation. Therefore, educators can foster more dynamic and effective learning environments by incorporating AI tools with traditional pedagogical approaches, thereby better preparing students to meet the linguistic and communicative requirements of writing.

5.2 Conclusion

The research investigated the effectiveness of artificial intelligence (AI) tools, particularly QuillBot, in improving writing abilities of EFL university students. The central hypothesis was that AI support would lead to notable improvements in students' writing across three dimensions: Reformulation Proficiency, Clarity Optimization, and Lexical Advancement. To test this, the study collected both numerical data from pre- and post-tests analyzed with ANOVA, as well as descriptive data from student reflections and observed results, which together provided a thorough understanding of the educational benefits of AI in writing instruction. The results of the study confirm that using AI tools can dramatically enhance EFL students' writing abilities. The students who participated in the experiment made impressive

progress in reformulation proficiency, showing they were much better at paraphrasing and rephrasing information in their own words. This is a crucial skill for writing enhancement, where being able to paraphrase effectively helps prevent plagiarism and demonstrate a writer's understanding. In the area of Clarity Optimization, AI support significantly enhanced students' ability to produce coherent, logically structured, and comprehensible texts. Writing after the intervention displayed smoother transitions, reduced redundancy, and improved audience awareness. These results suggest that AI tools can effectively complement instructor feedback by providing instant suggestions for structural and rhetorical refinement. In terms of Lexical Advancement**,** revealed that students exposed to AI support expanded their vocabulary range and made more precise lexical choices. Their writing reflected increased stylistic variety and contextually appropriate vocabulary use, which strengthened their overall academic voice. This aspect is crucial for EFL learners, who often struggle with limited vocabulary and repetitive phrasing. Students who used AI for writing not only improved their measurable performance but also reported feeling more confident and less anxious. The AI's immediate feedback and suggestions reduced their cognitive effort, allowing them to concentrate on more advanced writing concerns. The findings have important implications for both teaching and research. For one, AI tools should be considered as learning aids that complement, not replace, traditional instruction. They can provide students with round-the-clock, personalized feedback, essentially expanding the learning environment. Secondly, instructors must ensure students use these tools responsibly and critically, engaging with the suggestions thoughtfully instead of just accepting them. This study supports the growing body of research on digital innovations in EFL contexts. It proves that AI-powered tools can be transformative in tackling writing difficulties, particularly in higher education, where academic writing is key to student success. While the study showed strong positive outcomes, some limitations must be acknowledged. Occasional inaccuracies in AI-generated paraphrasing and vocabulary recommendations highlight the need

for learners to maintain active critical judgment. Moreover, the study focused on short-term outcomes; future research could investigate longitudinal effects, exploring whether skills developed with AI assistance transfer to independent writing tasks. Additionally, comparative studies across multiple AI tools could provide richer insights into the specific strengths and limitations of each platform. In concludes that AI tools, especially QuillBot, are extremely effective at boosting writing skills of EFL students. The tools not only help with reformulating sentences, improving clarity, and expanding vocabulary, but they also increase students' confidence and motivation, which are essential for continued improvement. By thoughtfully incorporating these AI writing assistants into teaching methods, educators can empower EFL learners to become more capable, self-reliant, and assured as writers, thus advancing their language proficiency and achievements on a global scale.

5.3 Limitations

While this study showed that using AI tools, such as QuillBot, can positively affect the writing abilities of EFL university students, its conclusions are limited. The small and specific sample of participants from a single university means the findings may not be widely applicable. A key concern is whether these results would be the same in different educational or cultural environments. Furthermore, the brief nature of the study prevents any firm conclusions about whether students can maintain these improved skills over time or use them without the aid of AI. This suggests a need for larger, longer-term studies in the future. QuillBot can be a helpful tool for improving writing, there are some potential downsides to consider. One concern is that students may become too dependent on AI and accept its suggestions without question. This could prevent them from developing their own critical thinking and writing skills. The study didn't measure how much students actively engaged with the feedback from the tool. The study also had a limited scope. It only focused on three areas of writing improvement: rewording, making writing clearer, and improving vocabulary. It didn't look at other important aspects of

writing, like how to develop an argument, properly use citations, or follow writing conventions for a specific field. Therefore, the study doesn't provide a complete picture of how AI affects writing skills. Another limitation is the technology itself. AI tools like QuillBot can sometimes produce incorrect or awkward paraphrases. Students need to use their own judgment to correct these errors, but the study didn't systematically investigate whether students were able to do so. Thus, the study suggests that AI tools can help with developing English as a Foreign Language (EFL) writing skills. However, the limitations of the study highlight the need for a cautious interpretation of the findings. Future research should address these issues to gain a better understanding of how to effectively integrate AI into writing instruction.

5.4 Recommendations for Future Research

Building on the findings and limitations of the present study, several recommendations can be made for future research into the role of AI tools in enhancing the writing skills of EFL university students. These recommendations are intended to deepen understanding, strengthen validity, and expand the pedagogical applications of AI-assisted writing. To make the findings more broadly applicable, future studies need to use a larger and more diverse group of participants. This study's focus on a single institution limits how much we can generalize the results. By including multiple universities and different cultural and regional settings, future research could better show how AI tools affect writing in various learning environments. Additionally, comparing English as a Foreign Language (EFL) and English as a Second Language (ESL) learners would help determine if AI's benefits differ based on a learner's exposure to English. It is essential to conduct longitudinal research to determine the sustainability of writing improvements. While this study demonstrated short-term gains in reformulation proficiency, clarity optimization, and lexical Advancement, it remains unclear whether students continue applying these skills independently after prolonged periods without AI support. Long-term studies could track whether AI-assisted writing transfers into

autonomous writing ability or if dependency on tools persists. The future studies should examine additional dimensions of writing skills beyond those explored here. While paraphrasing, clarity, and vocabulary are critical, writing proficiency also requires argument development, critical analysis, cohesion across extended texts, and proper citation practices. Research that integrates these aspects would provide a more holistic understanding of AI's contribution to writing competence. There is a need to investigate the critical engagement of students with AI outputs. Not all AI-generated suggestions are accurate or contextually suitable, and learners must develop evaluative skills to filter and adapt feedback effectively. Future studies could measure how students interact with AI feedback, whether they revise uncritically or demonstrate active decision-making in selecting appropriate changes. Hence, future research could explore comparative evaluations of different AI tools. While this study focused on QuillBot, numerous platforms exist (e.g., Grammarly, ChatGPT, Writefull), each with unique strengths and limitations. Comparative studies would help determine which tools has support specific aspects of writing and how they can be combined for maximum pedagogical benefit. In conclusion, future research should expand scope, duration, and dimensions of inquiry to better understand how AI can most effectively enhance EFL learners' writing abilities while fostering independence and critical literacy.

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Appendix A.