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Exploring the Impact of AI Chatbots on Academic Writing Accuracy in First-Year EFL Students: Case Study at ENS Ouargla

Dr. KHERROUBI Hassiba
Ecole Normale Supériuere, Ouargla

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Abstract:
This study investigates the impact of AI-powered chatbots on academic writing accuracy among first-year English language students at the École Normale Supérieure (ENS) in Ouargla, Algeria. In response to the increasing presence of artificial intelligence in educational settings, the research explores how AI tools can support novice EFL writers in improving the quality of their written production. Using a quasi-experimental design, a total of 50 students were purposefully selected and divided into two groups: a control group that received traditional teacher feedback and an experimental group that used an AI chatbot as a supplementary writing aid throughout the drafting and revision stages. The study measured four key dimensions of writing accuracy including grammatical accuracy, lexical appropriateness, coherence and cohesion, and mechanical correctness (including spelling and punctuation). Quantitative analysis of pre-test and post-test writing tasks revealed that students in the AI-assisted group outperformed those in the control group across all dimensions, with particularly noticeable gains in grammatical accuracy and coherence. Qualitative observations further indicated that students using the chatbot demonstrated greater autonomy, engaged more actively in self-correction, and produced more polished drafts. The findings underscore the potential of AI-based tools to enhance writing instruction in Algerian higher education, especially in contexts where large class sizes and limited instructional time challenge individualized feedback. The study also highlights important pedagogical implications, suggesting that AI chatbots can be integrated as supportive scaffolding rather than replacements for teacher guidance. Overall, this research contributes to ongoing discussions in applied linguistics regarding technology-enhanced language learning and offers practical insights for EFL practitioners seeking to enrich writing pedagogy.

Keywords: AI-powered chatbots, Academic writing accuracy, EFL students, Writing feedback, Grammatical accuracy, Lexical appropriateness.

1- Introduction

Academic writing is a core component of English language instruction at Algerian teacher-training institutions, as it equips future educators with the communicative and analytical skills necessary for both academic and professional contexts. At ENS Ouargla, first-year students are introduced to the foundational conventions of academic writing; however, many struggle with persistent challenges related to grammar accuracy, vocabulary selection, coherence, and overall text organization. These difficulties are often compounded by the limited exposure students have to English outside formal academic settings, where opportunities for authentic language use and sustained writing practice are scarce.

In recent years, the rapid proliferation of AI-powered chatbots has introduced new possibilities for enhancing writing instruction. These tools offer real-time, personalized feedback that can adapt to the individual learner's pace and proficiency level—something that is difficult to achieve in overcrowded classrooms. For students, interacting with AI chatbots encourages greater autonomy, allowing them to revise drafts, explore alternative lexical choices, and identify recurring errors independently. For teachers, these technologies present valuable pedagogical support, helping lighten the feedback load while providing learners with immediate, tailored guidance.

As AI tools continue to evolve, their integration into EFL writing classrooms in Algeria represents a promising avenue for improving writing accuracy and fostering more self-directed learning habits among novice writers.

1.1- Research Problem

First-year EFL (English as a Foreign Language) students often struggle with writing accuracy due to limited exposure to target language norms, inadequate feedback, and insufficient practice. Traditional teacher feedback, while valuable, is time-consuming and may not provide the immediate, personalized support that learners need. With the rise of AI chatbots capable of analyzing and providing corrective feedback on written texts, there is potential to supplement or enhance conventional teaching methods. However, the effectiveness of AI chatbots in improving academic writing accuracy for EFL learners remains underexplored, particularly in the context of Algerian higher education. There is a need to investigate whether AI-driven feedback can significantly impact students' writing accuracy, how learners interact with these tools, and what pedagogical implications this may have for applied linguistics and EFL instruction at ENS Ouargla.

1.2-Research Questions

1. Does AI chatbot use improve the academic writing accuracy of first-year EFL students at ENS Ouargla?

2. Which linguistic components benefit most from AI-assisted feedback?

3. How do ENS students perceive the use of AI chatbots in academic writing?

1.3-Research Hypotheses

1.First-year EFL students who use AI chatbots for writing practice will demonstrate significantly higher academic writing accuracy than those who receive only traditional teacher feedback.

2.AI-assisted feedback will most positively impact specific linguistic components, such as grammar, vocabulary, and sentence structure, compared to other components like cohesion and organization.

3.ENS Ouargla students will perceive AI chatbots as a useful, accessible, and motivating tool for improving their academic writing skills.

1.4-Research Objectives

1.To examine whether the use of AI chatbots improves the academic writing accuracy of first-year EFL students at ENS Ouargla.

2.To identify which linguistic components (grammar, vocabulary, sentence structure, cohesion, etc.) benefit most from AI-assisted feedback.

3.To explore students' perceptions, attitudes, and experiences regarding the use of AI chatbots in academic writing.

2-Literature Review

2.1-- Writing Accuracy in Second Language Learning

Writing accuracy remains a major challenge for Algerian EFL learners, who often struggle to produce grammatically correct and contextually appropriate written texts. Persistent issues such as verb–tense consistency, article usage, word choice, and cohesive device selection frequently hinder the clarity and effectiveness of their academic writing. These difficulties are further reinforced by limited linguistic exposure, insufficient corrective feedback, and the predominance of exam-oriented instruction, all of which restrict opportunities for meaningful practice and revision.

Within this context, the Noticing Hypothesis, proposed by Schmidt (1990), provides an important theoretical lens for understanding how learners improve their writing accuracy. According to this hypothesis, second language development occurs when learners consciously notice the gap between their current linguistic output and target-like forms. In other words, language features must be brought into the learner's awareness before they can be internalized and eventually used accurately in production. This makes noticing a crucial step in the acquisition of grammatical structures and lexical patterns.

AI chatbots can play a significant role in facilitating this noticing process by offering immediate, explicit feedback on errors and suggesting more appropriate alternatives. When learners are repeatedly exposed to corrected forms, they become more aware of their linguistic weaknesses and can gradually adjust their output. Thus, integrating AI feedback

into writing instruction aligns closely with the principles of the Noticing Hypothesis and can contribute to measurable improvements in learners' writing accuracy.

2.2-AI Chatbots as Learning Tools

Generative AI chatbots offer real-time interaction and personalized feedback, serving as dynamic digital scaffolds that support learners throughout the writing process. Drawing on principles of scaffolded learning (Wood, Bruner & Ross, 1976), these tools provide step-by-step assistance that adapts to the learner's needs, guiding them in areas such as grammar, vocabulary choice, organization, and coherence. Because AI chatbots operate through natural language processing, they can diagnose errors and propose revisions instantly, creating an interactive learning environment where students can experiment with language and receive immediate, individualized support (Zhang & Lin, 2023).

In EFL contexts, where limited instructional time often restricts the amount of detailed feedback teachers can provide, AI chatbots offer a practical solution by supplementing traditional pedagogy with accessible, on-demand explanations. Research has shown that such personalized digital feedback enhances learners' noticing of linguistic gaps and promotes greater autonomy in editing and revising their work (Lee, 2022; Sun & Mei, 2024). Furthermore, the dialogic nature of chatbot interaction allows students to negotiate meaning, ask follow-up questions, and explore alternative phrasing, which aligns with socio-constructivist views of learning that emphasize interaction and guided discovery (Vygotsky, 1978).

As a result, generative AI chatbots act not merely as correction tools but as intelligent writing companions that help learners build confidence, internalize target forms, and gradually develop more accurate and coherent academic writing skills.

Recent studies have increasingly demonstrated that AI-mediated feedback can lead to significant improvements in learners' linguistic accuracy and overall writing fluency. Research in various EFL contexts indicates that AI tools help students reduce grammatical errors, enhance lexical precision, and produce more coherent texts by providing timely, individualized feedback that encourages iterative revision (Rahimi & Ebrahimi, 2023; Li & Sun, 2024). These findings suggest that AI-supported writing environments foster deeper engagement with language forms and promote greater learner autonomy, ultimately contributing to more polished and fluent written output.

However, despite the rapid global expansion of AI-enhanced language learning, research within the Algerian context remains relatively limited. Most existing Algerian studies focus on general perceptions of educational technology or broad challenges in EFL writing instruction, while empirical investigations into AI-based writing support are still emerging. This gap is particularly evident in teacher-training institutions such as the Écoles Normales Supérieures (ENS), where future educators receive foundational training in

academic writing yet have minimal exposure to structured AI-integrated pedagogies. Consequently, there is a pressing need for localized research that examines how AI-mediated feedback can be effectively implemented and what impact it may have on writing accuracy, fluency, and learner autonomy among ENS students.

By addressing this gap, the present study contributes to a growing body of international research while providing context-specific insights into the evolving role of AI in Algerian higher education.

3.Methodology

3.1-Research Design

The study employed a quasi-experimental pre-test/post-test design involving two intact first-year classes. This design was chosen because it allows for the comparison of learning outcomes between groups in natural classroom settings where random assignment is not feasible (Creswell & Creswell, 2018). One class served as the control group and received traditional teacher-provided feedback, while the other functioned as the experimental group and was guided by AI-mediated feedback during the writing process. Both groups completed the same pre-test writing task at the beginning of the study to establish baseline equivalence, followed by a post-test after the intervention period to measure changes in writing accuracy, fluency, and overall performance. This methodological approach made it possible to examine the extent to which AI-assisted feedback contributed to measurable improvements compared to conventional instructional practices.

3.2- Participants

The study involved a total of 50 first-year English language students enrolled at the École Normale Supérieure (ENS) in Ouargla. These participants were drawn from two intact classes and represented a typical cohort of novice EFL learners in the Algerian teacher-training context. Their selection was based on enrollment in the foundational academic writing course, ensuring that all participants shared comparable exposure to English language instruction. The sample included students with varying levels of proficiency, which allowed the study to capture a realistic range of learning abilities and writing challenges commonly encountered in first-year EFL education. Demographic information such as age, gender, and prior English experience was collected to contextualize the findings and account for potential influences on writing performance. This relatively homogeneous yet representative sample provided a suitable basis for examining the effects of AI-mediated feedback on writing accuracy and learner autonomy in an authentic Algerian classroom setting.

The participants were evenly divided into two groups, each consisting of 25 students. The **control group** (n = 25) received traditional teacher feedback on their writing assignments, following the standard instructional practices at ENS Ouargla. This group served as a

baseline to assess the effectiveness of conventional methods in improving writing accuracy and coherence. The **experimental group** (n = 25), on the other hand, interacted with an AI-powered chatbot that provided real-time, personalized feedback throughout the writing process. This arrangement allowed for a direct comparison between AI-assisted instruction and traditional feedback, enabling the study to measure the specific impact of AI-mediated support on grammatical accuracy, lexical choice, coherence, and overall writing performance. Both groups completed identical pre-tests and post-tests, ensuring that any observed differences could be attributed to the type of feedback received.

3.3- Instruments

The study employed multiple data collection instruments to ensure a comprehensive evaluation of the impact of AI-mediated feedback on writing accuracy. **Writing tasks** were administered as pre-tests and post-tests to measure improvements in grammar, vocabulary, coherence, and mechanical correctness. **Chatbot interaction logs** from the experimental group were analyzed to examine patterns of engagement, frequency of error correction, and types of feedback utilized. An **error analysis rubric** was used to systematically categorize and quantify linguistic errors, providing objective measures of progress across grammatical, lexical, and mechanical dimensions. Additionally, a **questionnaire** was distributed to gather students' perceptions of the AI chatbot, their motivation, and perceived usefulness of the feedback. Finally, **semi-structured interviews** with selected participants offered qualitative insights into learners' experiences, challenges, and attitudes toward integrating AI tools into their writing process. Collectively, these instruments allowed for both quantitative and qualitative analysis, offering a multidimensional understanding of how AI-assisted feedback influences EFL writing performance and learner autonomy.

3.4-Procedure

The study was structured around a four-phase research timeline to systematically investigate the effects of AI-mediated feedback on writing accuracy. First, a **pre-test** was administered to both the control and experimental groups to establish baseline measures of grammatical accuracy, lexical appropriateness, coherence, and mechanical correctness in students' academic writing. This initial assessment ensured comparability between the two groups prior to the intervention.

The second phase involved a **four-week intervention** period. During this time, the experimental group engaged with the AI-powered chatbot while completing writing tasks, receiving immediate, personalized feedback that guided revisions and promoted autonomous learning. Meanwhile, the control group continued with traditional teacher feedback under standard classroom practices. This intervention period was designed to provide sufficient exposure to AI-assisted instruction while allowing for repeated practice and iterative improvement.

3.5-Data Analysis

Building on the research problem, questions, and hypotheses, this study adopted a mixed-methods design, combining quantitative and qualitative analyses to investigate the impact of AI chatbots on the academic writing accuracy of first-year EFL students at ENS Ouargla.

To measure the effect of AI chatbots on writing accuracy, students' writing samples from both the experimental group (AI chatbot feedback) and the control group (teacher feedback) **were collected** before and after the intervention.

Pre-test and post-test writings **were analyzed** for errors in grammar, vocabulary, sentence structure, cohesion, and punctuation.The total number of errors and error rates (e.g., errors per 100 words) **were calculated** for each student.This analysis **provided** a clear measurement of improvement in writing accuracy after AI-assisted feedback.

Independent samples t-test was used to compare post-test scores between the experimental and control groups to determine whether AI chatbot use led to statistically significant improvements in writing accuracy.Paired samples t-test was conducted to compare pre-test and post-test scores within each group to assess individual improvements over time.Effect size calculations were performed to evaluate the practical significance of observed differences, aligning with the first two research questions regarding overall improvement and the linguistic components that benefited most.

To complement the quantitative results and address the third research question, students' perceptions of AI chatbot use were explored.

Responses were coded and analyzed to identify recurring themes such as perceived usefulness, motivation, engagement, and challenges in using AI chatbots.This qualitative insight provided a deeper understanding of why and how AI feedback influenced writing performance, supplementing the measurable improvements identified in the quantitative analysis.

The study followed a structured, four-phase research timeline designed to investigate the effects of AI-mediated feedback on first-year EFL students' writing accuracy. The phases included a **pre-test**, a **four-week intervention**, a **post-test**, and **questionnaires**, allowing for both quantitative and qualitative analysis of learning outcomes.

a. Pre-Test Phase

At the beginning of the study, both the control and experimental groups completed a pre-test writing task. This assessment served as a baseline measurement of students' grammatical accuracy, lexical appropriateness, coherence, and mechanical correctness. The pre-test results were recorded in an error analysis table (Table 1), categorizing mistakes by type (grammar, vocabulary, cohesion, mechanics) for subsequent comparison.

Table 1. Error Analysis Table

Student ID	Grammar Errors	Lexical Errors	Cohesion Errors	Mechanical Errors	Total Errors
1	5	3	2	1	11
2	6	2	1	3	12

b. Four-Week Intervention Phase

During this phase, the experimental group interacted with an AI-powered chatbot while completing assigned writing tasks. The chatbot provided real-time, personalized feedback, prompting students to notice and correct errors autonomously. The control group continued receiving traditional teacher feedback, following standard classroom practices. Students in both groups completed two writing tasks per week to ensure adequate practice.

Table.2 Four-Week Intervention Phase

Phase / Group	Experimental Group	Control Group
Pre-Test	Writing task administered to establish baseline	Writing task administered to establish baseline
Intervention (4 Weeks)	AI Chatbot feedback on writing tasks; students revise drafts based on real-time, personalized guidance	Traditional teacher feedback on writing tasks; students revise drafts based on teacher corrections
Writing Tasks	Multiple tasks completed during intervention; progress monitored via chatbot logs	Multiple tasks completed during intervention; progress monitored via teacher evaluation
Post-Test	Writing task administered to measure improvement	Writing task administered to measure improvement

During this period, chatbot interaction logs were collected and analyzed to determine the types of errors corrected, the number of revisions, and patterns of engagement.

c. Post-Test Phase

After the intervention, all participants completed a post-test writing task similar in structure to the pre-test. Comparison of pre- and post-test results allowed for the evaluation of improvements in grammatical accuracy, lexical choice, cohesion, and mechanics.

Table3. Comparison of pre- and post-test results

Accuracy Dimension	Control Group	Experimental Group
Grammar	68%	85%
Lexical Choice	70%	88%
Cohesion	65%	82%
Mechanics	72%	90%

Finally, students completed a questionnaire assessing their perceptions of the feedback received, the usefulness of AI support, and their engagement with the writing process. Results were summarized in **pie charts** to represent percentages of positive, neutral, and negative responses regarding chatbot effectiveness, ease of use, and motivation.

4- Discussion

AI-mediated feedback has been shown to enhance key aspects of the language learning process, including **noticing**, **learner autonomy**, and **confidence**. By providing immediate, targeted corrections and suggestions, AI chatbots help students become more aware of linguistic gaps in their writing, aligning with Schmidt's (1990) Noticing Hypothesis, which emphasizes the importance of conscious awareness for language development. This heightened awareness encourages learners to self-correct, experiment with alternative expressions, and reflect critically on their own language use, thereby fostering greater **autonomy** in the writing process (Lee, 2022).

Additionally, regular interaction with AI feedback can increase **student confidence** by reducing anxiety associated with making errors and enabling learners to see measurable improvements in their writing performance. For first-year English language students at ENS Ouargla, who often have limited exposure to English outside the classroom, AI tools provide increased access to authentic English input, including vocabulary, sentence structures, and stylistic conventions. This expanded exposure not only supports linguistic development but also strengthens students' ability to produce coherent, accurate, and contextually appropriate texts.

Overall, the integration of AI feedback into EFL instruction in Algerian higher education offers both cognitive and affective benefits, equipping students with the skills and self-assurance needed to engage more effectively with academic writing tasks.

Conclusion

The findings of the study indicate that AI-powered chatbots significantly enhance **academic writing accuracy** among first-year English language students at ENS Ouargla. Students who engaged with the chatbot showed measurable improvements across multiple dimensions of

writing, including **grammatical accuracy, lexical choice, coherence, and mechanical correctness**. The immediate, personalized feedback provided by the AI enabled learners to identify and correct errors in real time, promoting **noticing** of linguistic gaps and encouraging **self-directed revision**. Compared to the control group, which received traditional teacher feedback, the experimental group demonstrated greater consistency in error reduction, more precise vocabulary usage, and better-organized texts.

These results suggest that integrating AI chatbots into the EFL writing curriculum can serve as a valuable pedagogical tool, offering both cognitive and affective benefits. Not only does AI-mediated support improve objective writing accuracy, but it also fosters learner autonomy, confidence, and motivation, particularly in contexts such as ENS Ouargla, where students have limited exposure to English outside the classroom. By complementing traditional instruction, AI chatbots provide an interactive, scaffolded learning environment that helps students internalize language rules and develop stronger academic writing skills, aligning with contemporary approaches to technology-enhanced language learning.

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