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The Effect of Generative AI-Assisted Feedback on EFL Students' Writing Performance

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Abstract

The integration of generative Artificial Intelligence (AI) in education has introduced new possibilities for enhancing formative assessment practices, particularly in language learning contexts. In EFL classrooms, providing individualized and timely feedback on writing remains a persistent challenge due to teacher workload and limited instructional time. Generative AI systems offer potential support by producing immediate, structured feedback that may assist students during the revision process. This study investigates the effect of AI-assisted formative feedback on the writing performance of second-year baccalaureate students in an EFL context. Adopting a one-group pretest–posttest quasi-experimental design, 20 students completed an in-class writing task under controlled conditions. Their handwritten texts were evaluated using an analytic scoring rubric, then processed through a generative AI system to generate structured feedback focusing on grammar accuracy, vocabulary use, organization, and coherence. After reviewing the AI-assisted feedback, students revised their drafts, which were subsequently re-evaluated using the same rubric. Data analysis included descriptive statistics to examine mean score differences and a paired-samples t-test to determine whether observed improvements were statistically significant. The study provides empirical insight into the pedagogical value of AI-assisted formative feedback and contributes to ongoing discussions regarding the responsible integration of generative AI in EFL writing instruction.

1. Introduction

In recent years, artificial intelligence (AI) has gained significant attention in educational research, especially regarding its potential to impact students' learning processes. An increasing number of studies have examined how AI-based tools can support teaching and learning across various disciplines. In language education, these technologies are more

frequently used to help students during the writing process by providing automated feedback and suggestions to enhance their texts.

Although research on AI in education has expanded rapidly, studies specifically examining the role of AI-generated feedback in improving students' writing performance remain relatively limited. This gap is particularly noticeable in the Moroccan context, especially at the high school level, where students often struggle to develop English-as-a-foreign-language writing skills. In many classrooms, teachers also face challenges such as limited time and large class sizes, which can make it difficult to provide detailed and individualized feedback on students' writing. Within this context, AI-based feedback tools are often presented as a promising alternative. One of their main advantages is the ability to provide immediate and repeated feedback across different stages of the writing process, allowing students to review and revise their work multiple times (Klimova & Pikhart, 2023). Unlike traditional feedback practices that are typically provided after a task is completed, AI-generated feedback can support a more continuous writing process in which students gradually refine their ideas and language.

Previous research suggests that the impact of AI-generated feedback can be observed in several key components of writing, including content development, organization, vocabulary use, and writing mechanics (Kayyis, 2025). Improvements in these areas may help students express their ideas more clearly, organize their texts more effectively, and use language more accurately. Studies have increasingly examined the role of AI-generated feedback in improving students' writing performance in EFL contexts. For instance, Ekizoğlu and Demir (2025) found that students who received AI-assisted feedback demonstrated significant improvement in several aspects of writing, particularly grammar, vocabulary, and textual coherence. In their experimental study involving secondary-level EFL learners, the group that received AI-generated feedback showed greater gains in overall writing performance compared to students who relied solely on teacher feedback. These findings suggest that AI-driven feedback can serve as an effective supplement to traditional writing instruction, supporting learners in improving linguistic accuracy and clarity.

Similarly, other studies have reported positive effects of AI-supported feedback on students' writing development. Research investigating the use of generative AI tools for writing revision has shown that learners who receive automated feedback tend to achieve higher writing scores and engage more actively in the revision process compared to those receiving conventional instruction (Mekheimer, 2025). In addition, studies exploring the integration of AI chatbots with teacher feedback have found that combining automated feedback with instructor guidance can significantly improve students' argumentative writing performance and provide more individualized learning support. Furthermore, some research suggests that AI-generated feedback is particularly effective in addressing surface-level writing issues such as grammar and vocabulary, while teacher feedback may better support higher-level aspects such as idea development and organization. Together, these findings highlight the growing potential of AI-assisted feedback to support writing instruction in EFL contexts and suggest that AI tools can play a complementary role in helping students revise and improve their written work. However, further research is still needed to understand how AI-generated feedback influences students' writing development in specific educational settings.

For this reason, the present study aims to explore the impact of AI-generated formative feedback on the writing performance of Moroccan high school students learning English as a foreign language. By examining how students respond to and revise their texts after receiving AI-based feedback alongside teacher guidance, the study seeks to contribute to the growing discussion on the pedagogical potential of artificial intelligence in language learning and to provide insights that can be relevant for similar EFL contexts.

2. Literature Review

The integration of artificial intelligence (AI) into language education has significantly transformed approaches to teaching and learning, particularly in the domain of writing instruction. In recent years, generative AI tools have been increasingly explored as potential sources of automated feedback, offering new opportunities to support students' writing development. Feedback has long been recognized as a central component of effective writing instruction, as it enables learners to identify weaknesses, revise their work, and improve overall performance. However, traditional teacher-provided feedback is often constrained by time limitations and workload, especially in contexts with large class sizes. As a result, researchers have turned their attention to AI-generated feedback as a complementary solution.

Recent empirical studies provide growing evidence of the effectiveness of AI-assisted feedback in enhancing EFL learners' writing performance. Mekheimer (2025) found that students who received generative AI-assisted feedback demonstrated significant improvements in writing proficiency, revision frequency, and overall text quality. The study also highlighted that AI-supported feedback encouraged more active engagement in the revision process and contributed to increased learner confidence. Similarly, Ekizoğlu and Demir (2025) reported that AI-assisted feedback positively influenced secondary school students' writing skills, particularly in terms of grammatical accuracy, vocabulary use, and coherence, suggesting that AI-generated feedback can serve as an effective supplement to traditional instruction.

Comparative studies have also examined the relative effectiveness of AI-generated and teacher feedback. Alnemrat et al. (2025) demonstrated that AI feedback can produce comparable, and in some cases superior, improvements in students' argumentative writing performance. However, the study also emphasized the importance of combining AI feedback with teacher guidance to ensure pedagogical appropriateness. In a similar vein, Tran (2025) investigated the sequencing of AI-generated and teacher-generated feedback and found that integrating both forms of feedback leads to more effective revision practices. These findings reinforce the idea that AI should not replace teachers but rather function as a supportive tool within a broader instructional framework.

In addition to performance outcomes, several studies have explored how students interact with AI-generated feedback during the writing process. Research indicates that AI tools can facilitate more frequent revisions and promote learner engagement by providing immediate and detailed feedback. However, scholars also caution that the effectiveness of AI feedback depends on how it is used. Without proper guidance, students may rely on AI passively rather than engaging critically with feedback. This concern highlights the need for teacher mediation and structured implementation of AI tools in classroom settings.

Earlier research on automated feedback systems also provides a foundation for understanding current developments in AI-assisted writing. Stevenson and Phakiti (2014)

demonstrated that computer-generated feedback can improve aspects of writing quality, particularly in grammar and mechanics. More recent systematic reviews, including Shi and Aryadoust (2024), confirm that AI-based feedback systems have evolved significantly and are now capable of addressing higher-level writing features such as organization and coherence. These advancements suggest that generative AI represents a more sophisticated and comprehensive form of automated feedback compared to earlier technologies.

Despite these promising findings, the implementation of AI in writing instruction raises important pedagogical considerations. Researchers emphasize that AI-generated feedback should be integrated carefully to support, rather than replace, meaningful learning processes. The role of the teacher remains essential in guiding students' interpretation of feedback and ensuring its relevance to learning objectives. Furthermore, there is a need for more context-specific research, particularly in underexplored educational settings such as Moroccan secondary schools, where the use of AI in language learning is still emerging.

In light of the existing literature, it is evident that AI-generated feedback holds significant potential for enhancing writing performance in EFL context s. However, further research is needed to examine its effectiveness in different educational environments and to explore how it can be optimally combined with teacher feedback. The present study seeks to contribute to this growing body of research by investigating the impact of AI-assisted formative feedback on high school students' writing performance within the Moroccan context.

3. Methodology

This section outlines the research design, participants, instruments, and procedures used to investigate the impact of AI-assisted feedback on students' writing performance. It also describes the methods used to analyze the collected data.

3.1 Research Design

The present study employed a quasi-experimental research design to examine the impact of AI-generated feedback on students' writing performance. This design was considered appropriate because the study introduced an instructional intervention while being conducted in a natural classroom setting without random assignment of participants. All students in the class participated in the same instructional activity and were exposed to the same feedback procedure. Initially, students were asked to produce a short piece of writing in response to a prompt asking them to discuss the advantages and disadvantages of technology in daily life. These initial texts constituted the first draft of their writing. The researcher then generated feedback using ChatGPT, focusing on aspects such as grammar, ideas, coherence, and organization. The researcher acted as a mediator by reviewing and delivering the AI-generated feedback to the students. After receiving this feedback, students were asked to revise their texts and produce a second draft. The comparison between the first and the revised drafts allowed the researcher to examine potential improvements in students' writing following the feedback intervention.

3.2 Variables

In this study, the independent variable was the AI-generated feedback provided to students after the initial writing task. The dependent variable was students' writing performance, measured through the analytic rubric assessing ideas, coherence, grammar, and

organization. Improvement in students' scores between the first and second drafts was used to evaluate the potential impact of the feedback intervention.

3.3 Participants and Setting

The participants in this study were 20 second-year baccalaureate students enrolled in the literature stream at a Moroccan public high school. These students were learning English as a foreign language and had already received several years of formal English instruction as part of the national curriculum. The participants were selected using a convenience sampling method, as they belonged to the class taught by the researcher. The study was conducted in the students' regular classroom environment during normal instructional time. Conducting the research within a familiar classroom setting allowed the writing task and feedback intervention to take place under authentic learning conditions.

3.4 Instruments

The present study employed three main instruments for data collection. First, a short writing task was used to elicit students' written production. Students were asked to write a brief text discussing the advantages and disadvantages of technology in daily life, producing authentic written responses that could be analyzed before and after receiving feedback. Second, AI-generated feedback was used as the main intervention. Students' initial drafts were submitted to an AI tool, which generated constructive feedback focusing on grammar, ideas, coherence, and organization. The researcher reviewed this feedback and delivered it to the students, acting as a mediator between the AI system and the learners. Third, an analytic scoring rubric was used to evaluate students' writing performance. The rubric assessed four components: ideas, coherence, grammar, and organization, each scored on a scale of 0–2.5, resulting in a maximum score of 10 points for each writing sample.

3.5 Procedure

The study was conducted during regular classroom sessions and followed several stages. First, students were given a writing task asking them to discuss the advantages and disadvantages of technology in daily life, producing a short written response individually within a limited time. These texts constituted the first draft of their writing. After collecting the students' initial texts, the researcher submitted each piece of writing to ChatGPT in order to generate feedback. The prompt used for each individual piece of writing was as follows: "Provide constructive feedback on the following student's paragraph. Focus on grammar, ideas/content, coherence, and organization. Suggest improvements but do not rewrite the paragraph completely."

The AI tool provided constructive comments focusing on grammar, ideas, coherence, and organization. The researcher reviewed the generated feedback and made modifications to it to fit the students' level and understanding, then shared it with them, acting as a mediator to ensure that the feedback was clear and relevant to the learners. Following this stage, students were asked to revise their texts based on the feedback they received and produce a second draft. The revised texts were then collected and evaluated using the analytic rubric. Finally, the scores of the first and second drafts were compared and analyzed to examine potential improvements in students' writing performance after receiving AI-generated feedback.

3.6 Data Analysis

The collected data were analyzed using both descriptive and inferential statistical methods. Students' writing performances in both drafts were evaluated using the analytic rubric assessing four components: ideas, coherence, grammar, and organization, with a maximum score of 10 points for each writing sample. Descriptive statistics, including means and standard deviations, were calculated to provide an overview of students' writing performance before and after receiving feedback, helping to illustrate the general pattern of improvement between the first and second drafts. To determine whether the observed differences between the two sets of scores were statistically significant, a paired-samples t-test was conducted. This statistical test was selected because it allows for the comparison of two related sets of scores obtained from the same group of participants before and after an intervention. All statistical analyses were performed using IBM SPSS Statistics.

4. Results

To analyze the results of this study, a paired-samples t-test was conducted to examine whether students' writing performance improved after receiving AI-mediated feedback. Descriptive statistics reveal an increase in students' mean scores from 5.15 (SD = 1.88) in the pre-test to 6.93 (SD = 1.87) in the post-test, as shown in Table 1. The results of the paired-samples t-test, as presented in Table 2, indicate that this improvement was statistically significant, $t(19) = 13.33$, $p < .001$. These findings suggest that students demonstrated notable improvement in their writing performance after receiving AI-generated feedback mediated by the teacher.

Table 1. Descriptive Statistics

Test	N	Mean	SD
Pre-test	20	5.15	1.88
Post-test	20	6.93	1.87

Table 2. Paired t-Test Results

Comparison	Mean Difference	t	df	p
Pre-test vs. post-test	−1.78	−13.33	19	< .001

In addition to the statistical significance of the paired-samples t-test, the magnitude of the improvement is particularly noteworthy given the relatively small sample size of this study. With only twenty participants, detecting such a clear difference between the pre-test and post-test scores suggests that the improvement in students' writing performance was not only statistically significant but also consistent across the group. Small-scale classroom studies like this one often face limitations in statistical power; however, the substantial increase in mean scores indicates that the intervention had a meaningful effect on students' writing outcomes. These findings therefore provide preliminary evidence that AI-generated feedback, when mediated by the teacher, can contribute positively to the development of EFL learners' writing skills.

5. Discussion

The results of the present study are consistent with previous research investigating the role of artificial intelligence in writing instruction. For instance, Ekizoğlu and Demir (2025) found that students who received AI-assisted feedback demonstrated significant improvements in grammar, vocabulary, and coherence compared to those who relied solely on traditional feedback methods. Similarly, Klimova and Pikhart (2023) highlight the growing potential of emerging technologies to support language learning by providing learners with detailed and structured feedback. The findings of the current study reinforce these conclusions and suggest that AI-based feedback can be a valuable resource for supporting writing development in EFL contexts.

An important feature of the present study is that the AI-generated feedback was mediated by the teacher before being shared with students. Rather than interacting directly with the AI system, students received feedback that had been reviewed and interpreted by the teacher. This approach allowed the teacher to maintain an active role in the assessment process while benefiting from the analytical support provided by AI. The combination of AI-generated insights and teacher guidance may have contributed to the effectiveness of the feedback, as it ensured that comments remained relevant, clear, and appropriate for the students' level.

Overall, the findings of this study suggest that AI-generated feedback, when combined with teacher mediation, can play a supportive role in improving students' writing skills in EFL classrooms. The integration of such tools may provide teachers with additional resources to support the revision process and encourage students to engage more actively with feedback on their writing.

The findings of the present study indicate that AI-generated feedback contributed to a measurable improvement in EFL learners' writing performance. The increase observed in students' post-test scores compared to their pre-test results suggests that the feedback supported learners in identifying and addressing weaknesses in their written production. Improvements were particularly noticeable in key areas such as grammatical accuracy, organization, and clarity, which are central to effective writing in an EFL context.

These findings can be explained by the nature of AI-generated feedback, which provides structured and detailed comments on multiple aspects of writing. Such feedback may have encouraged students to engage more critically with their errors and to revise their texts with greater attention to linguistic form. Recent research supports this interpretation, showing that AI-based feedback can enhance learners' ability to refine their writing, particularly in areas such as content development and language accuracy (Lee et al., 2025). Similarly, studies have demonstrated that AI-generated feedback helps learners improve coherence and overall writing quality when used as part of a guided revision process (Pariyanto & Tungka, 2025).

The results of the present study are also consistent with broader research on AI-assisted writing tools. For example, recent studies on automated writing evaluation systems have shown that such tools can significantly improve learners' writing performance across multiple dimensions, including grammar, vocabulary, and sentence structure (Thummachit, 2025). In addition, a systematic review of AI-based feedback research highlights the growing effectiveness of automated feedback in supporting writing development across diverse EFL contexts (Shi & Aryadoust, 2024). These findings reinforce the argument that AI tools can serve as valuable supplementary resources in language learning.

An important feature of the present study is that the AI-generated feedback was mediated by the teacher before being shared with students. This approach appears to have enhanced the effectiveness of the feedback by ensuring that it was adapted to the learners' level and aligned with instructional goals. Recent research supports this perspective, indicating that combining AI-generated feedback with teacher guidance leads to greater improvements in students' writing performance than relying on AI alone (Tran, 2025). This suggests that the role of the teacher remains essential in facilitating the effective use of AI tools in the classroom.

Overall, the findings of this study confirm that AI-assisted feedback, when integrated within a pedagogically guided framework, can play a meaningful role in improving EFL learners' writing skills. They also contribute to the growing body of research emphasizing the importance of combining technological tools with teacher support to maximize learning outcomes in language education.

6. Limitations and Further Research

While the findings of the present study provide valuable insights into the use of AI-generated feedback in EFL writing instruction, several limitations should be acknowledged. First, the study was conducted with a relatively small sample of twenty second-year baccalaureate students from the literature stream within a single educational context. Although this sample allowed for an in-depth classroom-based investigation, future research could involve larger and more diverse groups of learners in order to explore whether similar outcomes can be observed across different educational settings and proficiency levels.

Second, the study focused on a single writing task related to the advantages and disadvantages of technology. Examining multiple writing tasks over a longer instructional period could provide further insights into how AI-assisted feedback contributes to the development of writing skills over time. Longitudinal research may therefore help determine the sustained impact of integrating AI-generated feedback into writing instruction.

Finally, in the present study, the AI-generated feedback was mediated by the teacher before being shared with students. While this approach ensured that the feedback remained pedagogically appropriate and aligned with the learners' needs, the research design did not isolate the effects of AI-generated feedback from those of teacher mediation. As a result, the observed improvement in students' writing performance may reflect the combined influence of both AI-assisted feedback and teacher support. Future studies could therefore explore different models of interaction with AI feedback, including more direct student engagement with AI tools, which could provide a deeper understanding of how students interpret, apply, and benefit from AI-generated feedback during the writing process.

Despite these limitations, the study contributes to the growing body of research on the pedagogical applications of artificial intelligence in language education and highlights the potential of combining AI-generated feedback with teacher guidance to support students' writing development.

7. Conclusion

This study investigated the potential of AI-generated feedback to support the development of writing skills among EFL learners. By comparing students' writing performance before and after receiving feedback generated with the assistance of ChatGPT, the findings revealed a noticeable improvement in the overall quality of students' written texts.

The increase in post-test scores suggests that structured feedback focusing on grammatical accuracy, organization, and clarity can facilitate more effective revision and contribute to enhanced writing performance. These findings are consistent with previous research indicating that AI-assisted feedback can improve linguistic accuracy and support writing development in EFL contexts (Ranalli, 2021; Stevenson & Phakiti, 2014).

The study also underscores the value of combining AI-generated feedback with teacher mediation. By reviewing and delivering the feedback to students, the teacher maintained an essential pedagogical role while benefiting from the analytical capabilities of AI tools. This blended approach reflects current perspectives in educational technology, which emphasize that AI is most effective when used to support, rather than replace, teacher expertise (Holmes et al., 2022). Such integration allows for more guided and meaningful engagement with feedback, ultimately enhancing the learning process.

Overall, the findings contribute to the growing body of research on the integration of artificial intelligence in language education and suggest that AI-assisted feedback can serve as a valuable resource for improving writing instruction in EFL classrooms. In line with recent studies highlighting the pedagogical potential of AI in language learning, this study supports the view that thoughtfully implemented AI tools can enrich feedback practices and promote students' writing proficiency (Zawacki-Richter et al., 2019).

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