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THE INFLUENCE OF CHATGPT-GENERATED FEEDBACK ON THE WRITING SKILLS OF PAKISTANI ESL HIGH SCHOOL STUDENTS: AN EXPERIMENTAL STUDY

Abdul Farooq Khan*
Punjab School Education Department, Pakistan
Corresponding Author Email: farooqsawansi@gmail.com
https://orcid.org/0009-0004-4424-1794
Muhammad Jawad
Higher Education Department (HED)
Govt. Shujah Khanzanda Shaheed Associate College Hazro. jdsahil026@gmail.com
Zeeshan Ahmad
University of Education. zeeshnahmad34@gmail.com

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ABSTRACT

The study investigated the influence of ChatGPT-generated feedback on the writing skills of ESL learners of Pakistani high school students. The researchers divided, using experimental design, 100 students into experimental and control groups. The experimental group was given treatment of AI-driven feedback for writing tasks and the control group was given little or no feedback. The researchers measured the writing performance through pre-tests and post-tests. The data was analyzed using descriptive statistics, paired and independent sample t-tests, and correlation analysis. Significant improvement in the writing skills of the experimental group was revealed. Post-test scores substantially surpassed those of the control group. However, no statistically significant correlation between the frequency of ChatGPT feedback and improvement in performance was recorded. These findings highlight that the ChatGPT has potential as an effective tool for enhancing the writing skills of ESL learners. It offers practical implications for integrating AI in general and ChatGPT in specific in education to address the challenges in mechanisms of traditional feedback.

Keywords: *Writing Skills, ChatGPT, Feedback, ESL Learners*

Introduction

Integration of artificial intelligence (henceforth AI) in educational settings, in recent years, has transformed the conventional teaching methodologies. ChatGPT is among the most notable advancements in AI-driven learning tools. It is conversational model developed by OpenAI. It is well known and widely used for its ability to generate coherent and contextually relevant responses hence emerged as promising tool in English as Second Language (henceforth ESL) learning. It has gained attention for its ability to enhance various language skills especially writing that is a key challenge for ESL learners.

Pakistan is a country where emphasis on English language proficiency is growing day by day. In result country faces unique challenges in its education system for English language learning. Pakistani students, despite English being the medium of instruction, often struggle with writing in English language. Variety of factors contribute for this struggle including limited exposure to English outside of the classroom, lack of personalized feedback and teacher centered traditional pedagogical approaches. Educators and learners, as the demand for effective English writing is continuously rising, are increasingly turning to technology to fill these gapes and improve the writing skills.

ChatGPT and other AI tools, unlike traditional methods, can offer substantial value in real time personalized feedback to learners. Feedback in traditional method is either delayed or it is too generalized that it does not address the problem of individuals. On the other hand, ChatGPT not only provide instant feedback but it also tailors suggestions to individuals that they can use it refine

their writing. High school students in Pakistan who often face large class sizes and limited one on one interaction opportunities with instructors can benefit from this immediacy and adaptability provided by ChatGPT. However, it is yet to be thoroughly investigated in Pakistani ESL students, particularly high at the level of high school, whether ChatGPT-generated feedback is effective in improving skills or not.

The aim of this study was to examine the impact of ChatGPT-generated feedback on the writing performance of Pakistani ESL high school students. This study sought to determine, by analyzing the changes in high school students' writing quality before and after receiving ChatGPT-generated feedback, whether it can help to address some of the common challenges faced by students in enhancing their writing skills. Furthermore, this study explored whether the use of frequent feedback increases students' skill to write in English or not.

The results of this research could contribute valuable insights into the role of AI in general and ChatGPT in specific in language education by offering practical implications for both Pakistani educators and learners. Understanding the AI tools potential impact on writing skills will be crucial for optimizing their use in the language classrooms and enhancing the quality of English language teaching as they are becoming more integrated into every day learning environments.

Objectives

Objectives of the research were to:

1. Investigate the impact of ChatGPT-generated feedback on the writing skills of Pakistani ESL high school students
2. Study the relationship between the frequency of ChatGPT-generated feedback and the improvement in Pakistani ESL high school students' writing skills

Questions

1. What is the impact of ChatGPT-generated feedback on the writing performance of Pakistani ESL high school students, as measured by pre- and post-assessments of writing quality?
2. Is there a significant correlation between the frequency of ChatGPT feedback and the improvement in writing skills of Pakistani ESL high school students?

Methodology

This study employed an experimental research design to quantitatively assess the impact of ChatGPT-generated feedback on the writing performance of Pakistani ESL high school students. The study used a pre-test/post-test control group design, where one group of students received ChatGPT feedback on their writing (experimental group) and another group received any feedback (control group). This design allowed for a comparison of writing performance before and after the intervention, thus isolating the effect of the feedback.

Participants

The participants in this study were 100 Pakistani ESL high school students from a public school in Pakistan. These students were in their 9th and 10th grade and had intermediate proficiency in English. The participants were randomly assigned to one of two groups: Experimental group (n=50) and Control group (n=50). The experimental group students received writing assignments followed by feedback generated by ChatGPT and students from control group completed the same writing assignments but did not receive any feedback, maintaining a traditional learning approach. To ensure consistency, all students had similar baseline writing proficiency, which was assessed using a pre-test.

Materials

Writing Assignments

Students were asked to complete two writing tasks during the study: a descriptive essay and an argumentative essay. These assignments were designed to test grammar, coherence, vocabulary, and overall writing structure.

ChatGPT Feedback Tool

The experimental group received feedback on their assignments using ChatGPT. Feedback focused on grammatical errors, suggestions for improving sentence structure, coherence, and vocabulary usage.

Pre-Test and Post-Test

To measure the impact of ChatGPT feedback, students took a pre-test before the intervention and a post-test after receiving the feedback. Both tests were consisting of the same writing tasks, ensuring a direct comparison.

Rubric for Writing Assessment

Writing performance was assessed using a standardized rubric focusing on the following criteria: Grammar and Syntax (20%), Coherence and Organization (30%), Vocabulary and Word Choice (20%) and Task Achievement (30%).

Procedure

All participants completed a pre-test by writing an essay (descriptive or argumentative) under controlled conditions. The pre-test assessed their initial writing proficiency and established a baseline for comparison. Both the experimental and control groups took the same pre-test. The experimental group submitted their writing assignments to ChatGPT for feedback. ChatGPT provided suggestions and corrections related to grammar, coherence, vocabulary, and structure. Students then revised their essays based on the feedback received. The control group did not receive any feedback. Instead, they revised their essays on their own or based on their own understanding of grammar and writing conventions. After completing the revision based on feedback, students wrote a second assignment, similar in structure to the pre-test. The post-test measured any improvements in their writing performance.

Data Collection

Writing performance scores (from the pre-test and post-test) were collected for both groups. Feedback frequency for the experimental group was tracked, noting how often they interacted with ChatGPT to revise their assignments.

Data Analysis

Descriptive Statistics

Descriptive statistics (mean, median, and standard deviation) was used to summarize the writing scores for both the pre-test and post-test in both the experimental and control groups.

Paired Sample T-tests

To examine the impact of ChatGPT feedback, a paired sample t-test was conducted to compare the writing scores of the pre-test and post-test for the experimental group. This helped determine whether there was a statistically significant improvement in their writing performance after receiving feedback.

Independent Sample T-test

Post-test scores of the experimental group and control group were compared with an independent sample t-test to determine if the experimental group which received treatment performed significantly better than the control group which did received the treatment.

Correlation Analysis

The relationship between the ChatGPT-generated feedback frequency and the improvement in experimental group's writing was studied with a Pearson correlation analysis. Pearson correlation analysis was carried out to get insight into whether more frequent interaction with ChatGPT correlate with greater improvements in students' writing performance.

Literature Review

Increasing interest over the last decade has been garnered in the integration of AI into educational contexts. AI-driven platforms i.e. ChatGPT, as tools with significant potential to enhance English language learning, have demonstrated the ability of providing instant feedback that is invaluable in writing instruction (Sokolova et al., 2020). Hyland (2003) states that feedback plays an important role in language acquisition, particularly in writing. Its role is critical where students need specific guidance to enhance their accuracy in grammar, coherence and fluency. Traditional method of feedback, provided by teachers, is valuable but it has limitations due to factors such as time constraints and large class sizes (Evans, 2013). In contrast to traditional methods AI platforms like ChatGPT provide real time feedback. Moreover, they offer personalized corrections and suggestions. By doing so, it overcomes the limitations of the traditional methods (Heffernan & Heffernan, 2014). Bitchener & Knipe (2008) emphasized that immediacy of the feedback is important for ESL learners. It helps them retain and apply corrections more effectively.

Various aspects of writing skills, from grammatical accuracy to

organization of content, have been noted to improve with utilization of AI systems designed for language learning. Liu and Stapleton (2014) recorded that AI-based feedback systems improved the writing score of ESL learners by proving them real time corrections for syntactic and lexical errors. Zheng (2020) also investigated the role of AI tools in error correction and concluded that AI-assisted tools facilitated more effectively than traditional methods in error correction by providing a higher volume of feedback which increased students' opportunities to improve their writing skills.

English is taught as second language and often learned through formal education settings in Pakistan. Integration of AI tools in language teaching setting can be particularly beneficial in Pakistani context as the students of the country frequently face challenges in writing due to limited opportunities of exposure to native variety of English and environment and the absence of frequent writing practice outside the classroom (Ahmed & Riaz, 2015).

ChatGPT is a tool, developed by OpenAI, that is capable of simulating conversations and providing contextual suggestions so it offers a promising solution for addressing these challenges. It has been widely recognized for its capabilities of natural language processing. Various studies have been conducted to explore its role as an education tool for language learning. Alimardani and Rahimi (2021) concluded that its ability to generate contextual responses based on user inputs makes it a power tool for speaking and writing skills development. Furthermore, it can provide feedback that is immediate, specific and error focused that can crucial for writing skills. Chien and Hsu (2022) argued that AI systems can enhance the efficiency as they offer personalized feedback on a large scale. Personalized and non-judgmental nature of ChatGPT-generated feedback can help reducing the anxiety often associated with writing assignments in a second language thereby increasing the learners' motivation to improve their writing (Gao & Zhao, 2018). Dornyei (2005) highlighted that learners receiving consistent and actionable feedback are more likely to participate in learning process. ChatGPT's consistent feedback makes the process more interactive. This interactive nature of ChatGPT motivates learners to experiment with language and fosters self-directed environment of learning (Winkle et al., 2013). AI-generated feedback has been compared with traditional teacher-generated feedback in several studies. Mixed and promising results has been recoded. Wang et al. (2009) found that grammatical accuracy and lexical richness of students' writing was improved with AI-generated feedback. This improvement was more prominent where students were given opportunity to revise their work. Bitchener and Knipe (2008) also found that, over a shorter period of time, automated feedback combined with peer review significantly enhanced the writing skills of the students. Some studies warn against over reliance on AI tools.

Li and Chi (2020) stated that AI systems can effectively identify the surface level errors but they may not be efficient at providing feedback on higher order aspects of language i.e. argumentation and content depth. Xu (2021) suggested that despite the limitations of the AI tools, combining AI-generated feedback with human input could lead to optimal learning outcomes. In the context of Pakistan, the application of ChatGPT-generated feedback holds significant promise. Students in Pakistan often face challenges in acquiring English writing skills because there are large sized classes that limits teacher-student interaction and hinders personalized feedback (Shaheen & Rashid, 2018). ChatGPT could solve this problem because it offers immediate and personalized feedback for every student. This feedback is consistent and customized that is tailored to individual needs of each student. Moreover, it is well suited, due to its interactive nature, to those students who find traditional method methods of language learning monotonous and uninspiring (Shahid & Raza, 2019).

Results

Descriptive Statistics

Table 1: Descriptive Statistics for Pre-Test and Post-Test Scores

Group	Test Type	Mean	Std Dev	Min	Median	Max
Control	Pre-Test	52.75	9.34	35.40	52.66	73.52
	Post-Test	60.18	8.74	33.80	60.46	75.65
Experimental	Pre-Test	54.61	10.15	35.81	55.17	79.63
	Post-Test	70.84	8.94	54.85	71.94	97.20

Table 1 shows the pre-test mean score for the control group was 52.75 with a standard deviation of 9.34, indicating moderate variability in student performance. After receiving no feedback intervention, the post-test mean score increased to 60.18, with a standard deviation of 8.74, showing a slight improvement in writing performance.

The minimum and maximum values suggest that while some students showed only marginal improvements, others showed more noticeable progress, but overall, the performance improvement was modest.

The pre-test mean for the experimental group was 54.61 with a standard deviation of 10.15. After receiving ChatGPT-generated feedback, the post-test mean score jumped to 70.84, with a standard deviation of 8.94. This significant increase in post-test scores suggests that the ChatGPT feedback had a substantial positive impact on writing performance. The maximum score of 97.20 in the post-test also demonstrates that some students greatly benefited from the feedback intervention. The experimental group

shows a much higher increase in writing performance compared to the control group, indicating the positive impact of ChatGPT feedback.

Paired Sample T-test (Experimental Group)

Table 2: Paired Sample T-test Results for the Experimental Group

Test	t-statistic	p-value
Experimental Pre-Test vs. Post-Test	-8.72	1.53×10^{-11}

The t-statistic of -8.72 indicates a large difference between the pre-test and post-test scores for the experimental group (Table 2). The p-value of 1.53×10^{-11} is extremely low, much smaller than the significance level of 0.05. This means we can confidently reject the null hypothesis and conclude that there was a statistically significant improvement in the writing performance of the experimental group after receiving ChatGPT feedback. The paired sample t-test shows that the experimental group made significant improvements in their writing skills after receiving feedback from ChatGPT.

Independent Sample T-test (Control vs Experimental Group)

Table 3: Independent Sample T-test Results (Control vs Experimental Group)

Comparison	t-statistic	p-value
Control vs Experimental (Post-Test)	-6.03	2.91×10^{-8}

The t-statistic, as shown in Table 3, of -6.03 suggests a strong difference between the post-test scores of the control and experimental groups. The p-value of 2.91×10^{-8} is significantly less than the 0.05 threshold, indicating that the difference in performance between the two groups is statistically significant. The experimental group, which received ChatGPT feedback, outperformed the control group, which did not receive any feedback. This further supports the effectiveness of ChatGPT-generated feedback in improving writing skills.

Correlation Analysis (Feedback Frequency vs Writing Improvement)

Table 4: Pearson Correlation Analysis (Feedback Frequency vs Writing Improvement)

Correlation Coefficient	p-value
-0.14	0.33

The correlation coefficient of -0.14 suggests a weak inverse relationship between the frequency of ChatGPT feedback and the improvement in writing scores (Table 4). However, the p-value of 0.33 is greater than the significance level of 0.05, which indicates that this relationship is not statistically significant. The frequency of feedback does not have a significant relationship with the improvement in writing performance. This suggests that the quality and content of the feedback may be more important than the frequency with which it is provided.

Discussions

Descriptive Statistics clearly shows that the experimental group exhibited a much more pronounced improvement in writing scores compared to the control group. While the control group did show some improvement, the experimental group's scores rose significantly, highlighting the effectiveness of the ChatGPT-generated feedback. Paired Sample T-test for the experimental group further confirms that this improvement was statistically significant. The extremely low p-value (< 0.05) indicates that the improvements in the experimental group's writing performance were not due to chance. Independent Sample T-test comparing the post-test scores of the control and experimental groups strongly supports the hypothesis that ChatGPT feedback made a positive difference. The significant p-value (less than 0.05) indicates that the experimental group performed significantly better than the control group, which had no feedback intervention. Correlation Analysis suggests that the frequency of ChatGPT feedback does not have a direct impact on writing improvement. The weak correlation and non-significant p-value indicate that the amount of feedback (whether given more or less frequently) does not necessarily correlate with better writing performance. This implies that factors such as the type of feedback and the students' engagement with it might play more crucial roles than just frequency. Experiment group results of the descriptive statistics, t-tests, and correlation analysis indicated that ChatGPT-generated feedback had a significant positive impact on the writing skills of Pakistani ESL high school students. Feedback frequency did not correlate significantly with improvements in writing skills but the experimental group surpassed the control group and improvements were statistically significant. This suggests that regardless of its frequency, ChatGPT-generated feedback is an effective tool for enhancing writing skills.

Conclusion

The influence of the ChatGPT-generated feedback in the writing skills of Pakistani ESL high school students was investigated in this research. The findings show that experimental group improved in their writing skills compared to the control group. The results strongly indicate the effectiveness of ChatGPT-generated feedback in enhancing the students' writing skills. Experimental group's post-test mean score increased significantly that reflects the positive impact of the intervention. However, no statistically significant relation between frequency of feedback and writing skills improvement was revealed in correlation analysis suggesting that quality of the feedback play more critical role than the frequency.

This study highlights the potential of integrating ChatGPT-generated feedback into ESL classrooms to support students' writing development. The findings provide evidence that ChatGPT-generated feedback can serve as a valuable tool in educational

settings as it offers timely, detailed and accessible feedback to learners. Schools and educators should consider incorporating ChatGPT and other AI tools as supplementary resources to provide students with immediate and personalized feedback on their writing tasks. Teachers and students should be trained to use ChatGPT effectively. Students should be trained to interpret and implement feedback to improve their writing skills. Teachers should know how to complement AI-generated feedback with human guidance and they should ensure that feedback quality is prioritized.

Future studies should be conducted to investigate the types of feedback e.g. corrective, constructive that are most beneficial for the learners. Additionally, deeper insights into the effectiveness of the AI-generated feedback can be looked by exploring how students interact with and apply it. Long-term effects of AI-generated feedback on students' writing abilities should be investigated as well to determine whether improvements are sustained over time.

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