

The Effectiveness of AI Real-Time Feedback Assistance in Improving Writing Skills

Shokhikhatul Khasanah*

Hukum Keluarga Islam, STAI Nuruddhaham Sumenep

ARTICLE INFO	ABSTRACT
Article History: Received : 23-March-2025 Approved : 17-June-2025 Keywords : Writing skills AI Feedback Real-Time Assistance EFL Writing Educational Technology	Abstract: This study aims to describe and test the effectiveness of using AI Real-Time Feedback Assistance in improving writing skills in students at STAI Nuruddhaham Sumenep. This study used an experimental method with pretest-posttest on two groups. The measuring instrument used is a writing skill assessment rubric. The analysis showed that there was a significant difference between the scores of students' project writing skills in the experimental group ($M=82$, $SE=4.68$) and the control group ($M=74$, $SE=6.94$) after the treatment. This finding indicates that the use of AI real-time feedback assistance has a positive influence on improving students' writing skills, so it can be an effective approach in improving writing skills. Abstract: Penelitian ini bertujuan untuk mendeskripsikan dan menguji efektivitas penggunaan <i>AI Real-Time Feedback Assistance</i> dalam meningkatkan <i>writing skill</i> pada mahasiswa di STAI Nuruddhaham Sumenep. Penelitian ini menggunakan metode eksperimen dengan pretest-posttest pada dua kelompok. Alat ukur yang digunakan adalah rubrik penilaian keterampilan menulis. Hasil analisis menunjukkan terdapat perbedaan yang signifikan antara skor keterampilan menulis proyek mahasiswa pada kelompok eksperimen ($M=82$, $SE=4.68$) dan kelompok kontrol ($M=74$, $SE=6.94$) setelah perlakuan. Temuan ini mengindikasikan bahwa penggunaan <i>AI real-time feedback assistance</i> memiliki pengaruh positif terhadap peningkatan keterampilan menulis mahasiswa, sehingga dapat menjadi pendekatan yang efektif dalam meningkatkan <i>writing skills</i>.
Correspondence Address : Shokhikhatul Khasanah Hukum Keluarga Islam STAI Nuruddhaham Sumenep Jl. Raya Ganding, Tama West Rentar, Regency Sumenep, East Java 69462 Email: sofiaalhaidari@gmail.com	

INTRODUCTION

STAI Nuruddhaham Sumenep students often face difficulties in developing their writing skills in English courses, especially in the process of evaluating and improving their writing. One of the main problems is the lack of effective feedback on their writing assignments. Students struggle to evaluate and improve their writing without direct lecturer assistance, as they do not have sufficient understanding to identify errors or areas for improvement (Alshafie et al., 2025). On the other hand, lecturers also face challenges in providing sufficient feedback to all students, given the limited lecture time and the limited allocation of credits. As a result, the feedback provided is often unstructured or only given randomly, which makes it difficult for students to get consistent and constructive information in improving the quality of their writing (Jiang et al., 2024).

This creates a gap in the learning process and the development of students' writing skills (Etaat, 2025; Zhu et al., 2025)

In an effort to overcome this problem, the researcher has tried to provide written feedback on each writing task done by students, either through direct comments on the writing or through a brief discussion after class. However, despite the efforts to provide feedback, the impact has not yet provided significant changes in improving students' writing skills. This is due to the limited time available to provide in-depth feedback to each student, given the number of assignments that must be evaluated and the limited lecture time. In addition, some students also have difficulty understanding the feedback given in writing, so they cannot utilize the suggestions given to improve their writing. The feedback provided is also not always appropriate to the individual needs of the students, as the process is general and does not focus on specific aspects that require more attention in a technical and detailed form. Despite efforts to help students, the development of their writing skills remains limited.

Students' writing skills are influenced by various factors, both internal and external. Internally, students' motivation and language ability play an important role in their ability to compose coherent and effective writing (Goshu & Gebremariam, 2024) Highly motivated students tend to be more proactive in improving their writing skills (Tran & Ma, 2025) In addition, understanding the structure and rules of writing also determines the quality of their writing. External influencing factors include the quality of feedback provided by lecturers, who should be able to provide clear and constructive directions for improvement. Limited time in lectures and limitations in the number of credits can also hinder deep learning (Jiang et al., 2024) In addition, access to supportive resources, such as additional learning materials and examples of good writing, can also affect the development of students' writing skills. In other words, the combination of motivation, adequate learning support, and effective feedback greatly affects the quality of students' writing skills.

The English course curriculum at STAI Nuruddhaham Sumenep has been designed to suit the various factors that influence the improvement of students' writing skills. The curriculum includes an approach that focuses on developing writing skills through various stages, ranging from a basic understanding of writing structures to more complex writing techniques. In it, students are provided with relevant material on topics that suit their academic and professional needs, and are directed to write in a structured and logical manner. In addition, the curriculum also provides space for lecturers to provide constructive feedback through writing assignments that are carried out regularly. In order for students to develop their writing skills optimally, the curriculum also includes practical exercises involving the writing of essays, articles, and reports that are discussed together to enrich their understanding of the proper and effective use of English. However, that must be taught sometimes limit the intensity of teaching these writing skills in depth, so there needs to be adjustments in the way time is managed and the feedback approach to achieve maximum results.

In the digital era, the presence of Artificial Intelligence (AI) is an important breakthrough in the world of education, including in improving student writing skills. AI has a significant role as a tool that is able to provide instant and objective feedback on student writing. With AI, the writing revision process becomes faster and more targeted, allowing students to understand grammatical errors, sentence structure, and paragraph cohesion directly. This not only accelerates the learning process, but also encourages self-reliance and continuous improvement of writing quality. Therefore, the integration of AI technology in writing learning is very relevant to support the development of academic competence in higher education.

Although many studies have addressed the use of technology, including artificial intelligence (AI), in English language learning and writing skills, there is a significant research gap related to the use of AI-based real-time feedback assistance to improve the speed and quality of assessment of student writing (Onrubia & Engel, 2012). Most previous studies have focused on the application of technology in general teaching aspects, such as the use of AI for texts analysis or Computer-Assisted Language Learning, but not many have specifically examined the impact of AI-based real-time feedback in the context of writing. This gap can be seen in the lack of research exploring how AI can provide immediate, accurate, and detailed feedback in real time during the writing process, which can speed up evaluation and provide opportunities for students to correct their mistakes immediately. In addition, many previous studies tend to focus on manual evaluation, which requires more time and effort from lecturers, making lecture time constraints a major

obstacle. AI-based real-time feedback assistance technology is expected to bridge this gap by providing faster and more structured feedback, helping students revise their writing more efficiently and effectively (Tajik, 2025).

Referring to previous research, it was stated that the improvement of writing skills through gamification was more pronounced in the neurotypical student group, while the group with special needs showed promising but not statistically significant results. The Orthography Training app played an important role in error awareness training (phonological and non-phonological errors) and improving the regulation of the automatic writing process. These results reinforce the theory that the use of gamification, especially those that provide audio-visual feedback and gradual improvement, can create an inclusive learning environment and support basic writing skills such as spelling and phonetic structure. Although not all results were significant, most students (including those with SEN) reported high levels of satisfaction and motivation towards using the gamified tool. This indicates that gamification can be a powerful support tool, especially when combined with traditional methods and a more personalized approach in special education.

The data is also reinforced by the results of a study (Asadi et al., 2025) which shows that writing ability in English as a foreign language (EFL) is one of the most challenging skills for learners to master. While classroom learning and teacher feedback have long been pillars of writing instruction, many students still lack personalized guidance to truly improve the quality of their writing. As educational technology evolves, especially with the advent of artificial intelligence (AI), tools like ChatGPT offer the potential to complement the teacher's role. ChatGPT is able to provide real-time, adaptive feedback on aspects of grammar, vocabulary, and writing structure. However, utilizing AI in education also presents challenges, such as the risk of plagiarism and limitations in understanding context.

Second language (L2) writing skills are an important aspect of academic and professional education, but are often difficult to develop through conventional methods alone (Asadi et al., 2025). Traditional approaches that rely on teacher feedback are often subjective, time-consuming, and cannot adapt to students' individual needs. Advances in artificial intelligence (AI) technology, especially in the context of Artificial Intelligence in Education (AIED), open up new opportunities to provide automated, predictive and objective feedback on student writing. AI tools such as Grammarly, ChatGPT, Instatext, and Wordtune have begun to be widely used to support writing practice, providing suggestions for grammar, sentence structure, and alternative vocabulary. This study shows that the use of AI-based applications significantly improves students' writing skills, especially in: Sentence structure, grammar, spelling, and punctuation, word choice. The integration of AI, particularly the GRNN model, proved effective in assessing and forecasting the development of L2 students' writing skills. Apps like Instatext and Wordtune help students develop writing skills better than traditional methods, provided they are used with proper supervision and pedagogy.

The purpose of this study is to implement the use of real-time feedback assistance based on artificial intelligence (AI) in the learning of college students' writing skills and to measure its effectiveness in improving their writing ability. This research aims to explore how the implementation of real-time feedback provided automatically during the writing process can speed up the identification of errors, provide specific corrective suggestions, and encourage students to be more active in the revision of their writing. In addition, this study also aims to measure the extent to which the use of this technology can improve the quality of student writing, in terms of structure, grammar, and clarity of ideas, compared to traditional teaching methods that rely on manual feedback from lecturers. By implementing real-time feedback assistance, this research hopes to contribute to improving the effectiveness of writing learning, providing a more responsive and interactive learning experience for students, as well as overcoming time constraints that are often an obstacle in providing in-depth feedback in a lecture context.

METHOD

Research Design

This study uses an experimental method to examine the effect of using real-time feedback assistance on improving students' writing skills. In accordance with the definition of experiment

submitted by (Han et al., 2021). This research provides certain treatment to the experimental group, namely the use of AI-based real-time feedback assistance, and then compares the results with the control group that did not get the treatment. Experimental research, according to (Nazari et al., 2021) aims to find the effect of certain variables (in this case, the use of real-time feedback assistance) on other variables (students' writing skills) under strictly controlled conditions. Thus, this study will control other variables that can affect students' writing outcomes, such as processing time and writing topic. The experimental research involves manipulating a variable to observe the effect on the behavior of the observed individual. In the context of this study, the manipulation is the application of real-time feedback technology in the writing learning process to determine its impact on students' writing ability.

Participants

The object of the research is the use of real-time feedback technology in the context of learning to write, while the research subjects are students of the Islamic Family Law Education study program who are taking English courses. This research was conducted at STAI Nuruddhahlan Sumenep. The study involved a total of 30 students, who were divided into two main groups: Experimental group (treated with AI-based real-time feedback assistance) and control group (not treated). Most of the respondents had limited experience or were familiar with the use of AI-based learning technology, so the application of real-time feedback assistance was new to them.

Proccedure

Figure 1 shows the flow of experimental research aimed at examining the effect of using real-time feedback assistance (RTFA) on students' writing skills. This diagram contains systematic stages, starting from setting research objectives, experimental design, determining control and experimental groups, providing treatment in the form of using RTFA, carrying out writing assignments with controlled variables such as topic and time, to the data collection and analysis stage. Through these stages, this research aims to obtain valid conclusions regarding the effectiveness of real-time feedback technology in improving students' writing skills.

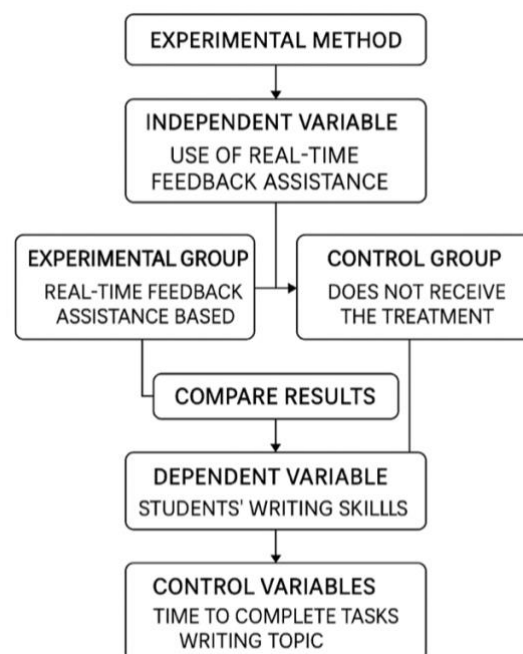


Figure 1. Experimental research method

Data Analysis

The data analysis technique used is quantitative analysis with t-test (both independent sample t-test and paired sample t-test) to determine the difference in writing skill scores between the experimental and control groups. Qualitative analysis was also used complementarily to the

observation and documentation data to strengthen the interpretation of the results and understanding of the process that took place during the study.

The data collection techniques used include observation, documentation, and written tests. Observation was conducted to monitor students' interaction with technology during the writing process, including noting changes in students' behavior and responses. Documentation included the collection of student writing results, evaluation notes, and logs of the use of feedback technology. Written tests were given to students both before and after the treatment, in order to measure the improvement of writing skills objectively and measurably. In addition, questionnaires can also be used to obtain additional data related to students' perceptions of the use of this technology.

RESULT

The characteristics of respondents in this study describe the demographic and academic profiles of students who are the subjects of research, namely students of the Islamic Family Law Education study program who take English courses at STAI Nuruddhahlan Sumenep. Understanding these characteristics is important to provide context related to the background of the participants and the relevance of the research results.

Based on the t-test data analysis, it can be stated that the data has met the criteria for normality test and homogeneity test. The data is presented in the description of table 1.

Table 1. Data Analysis Results Difference Test

Group	Mean	Std. Deviation
Experiment	82	4.68
Control	74	6.94

Based on the results of the T-test data analysis, it was found that there were differences in the writing skills scores of the experimental group and the writing skills scores of the control group. Experimental group Mean 82 and SE 4.68 after the intervention and control group Mean 74 and SE 6.94 with no treatment intervention

Table 2. Independent Sample t test data

Group	Sig. (2tailed)	T	Df
Gain Score	0.00198	3.27	48
Writing Skills			

The data in table 2 can be explained that the difference in scores between the experimental and control groups is significant because (sig 2 tailed) is 0.00198, which is lower than 0.05.

Table 3. t - test – Experimental group

Variables	Sig. (2tailed)	Mean Pretest	Mean Posttest	Information
Writing Skills	6.26e-06	71	82	Increase significant

Table 3 shows the results of the t-test on the experimental group. The significance value (Sig. 2-tailed) obtained is 6.26e-06 or 0.00000626, which is much smaller than the 0.05 significance limit. This shows that there is a highly statistically significant difference between the pretest and posttest scores of writing skills in this group. The average pretest score was 71, while the average posttest score increased to 82. Thus, it can be concluded that the implementation of the treatment in the experimental group had a significant positive impact on improving students' writing skills.

Table 4. t - test – Control group

Variables	Sig. (2tailed)	Mean Pretest	Mean Posttest	Information
Writing Skills	0.273	73	74	Increase

Table 4 show that the t-test results in the control group, the significance value (Sig. 2-tailed) was 0.273. This value is greater than 0.05, which means there is no significant difference between the pretest and posttest scores of writing skills in this group. Nevertheless, there was a slight increase in the mean score, from 73 in the pretest to 74 in the posttest. Thus, students' writing skills in the control group improved, but the improvement was not statistically significant.

Based on the results of data analysis in tables 3 and 4, it can be explained that the use of AI real time feedback assistance has a significant impact on the writing skills of students of English language courses. Based on these data, it can be concluded that there is a significant effect of using AI Realtime Feedback Assistance on the writing skills of students of English courses.

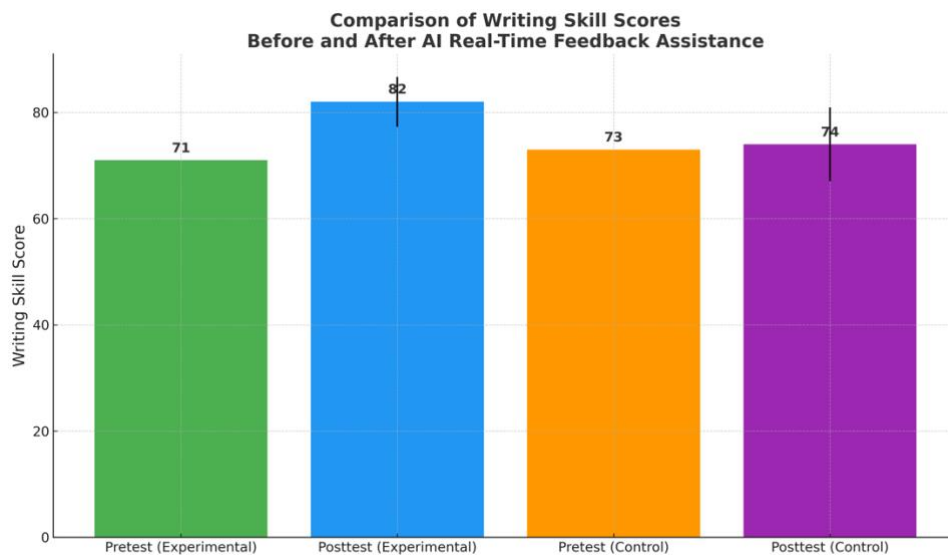


Figure 2. Comparison of data on the improvement of writing skills in the experimental and control groups.

The graph depicts the comparison of writing skill scores between two groups of students, namely the experimental group using AI Real-Time Feedback Assistance and the control group following conventional learning methods. The data shows that the experimental group experienced a significant increase in scores, from a pretest average of 71 to 82 in the posttest, showing an 11-point increase. In contrast, the control group only showed very minimal improvement, from a score of 73 to 74. This finding provides quantitative evidence that the use of AI-based real-time feedback technology can actually improve students' writing skills more effectively than the traditional approach. Thus, the implementation of AI in writing instruction can be a strategic solution to improve the quality and speed of writing skill acquisition in higher education settings.

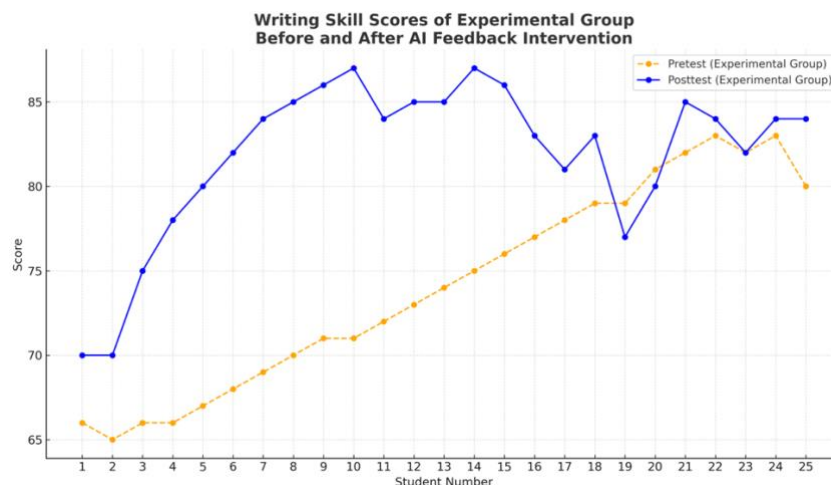


Figure 3. Distribution of experimental group students' scores

The graph displays the development of the experimental group students' writing skill scores before and after the intervention using AI Real-Time Feedback Assistance. The curve shows a consistent upward trend from pretest to posttest scores for almost all students, reflecting the effectiveness of the intervention in helping students improve their writing skills. The pretest scores were generally in the range of 65-83, while the posttest improved significantly with scores ranging from 70 to 87. However, there were two notable exceptions seen in student numbers 19 and 20. Their posttest scores actually decreased when compared to the pretest scores. This was not caused by a decrease in ability or effectiveness of the method, but rather by technical constraints in the task submission process. Students had problems using the platform in doing online assignments.

DISCUSSION

The use of AI Real-Time Feedback Assistance has a significant positive impact on students' writing skills because this technology is able to provide immediate and specific feedback during the writing process. With instant feedback, students can immediately recognize errors in grammar, sentence structure, and clarity of ideas they write (Sidikova & Axmedova, 2025). This is in contrast to traditional methods that rely on manual feedback from lecturers who are often limited by time and the number of assignments to be evaluated. Therefore, AI real-time feedback helps bridge the gap in the learning process of writing by providing quick and structured responses that improve learning effectiveness (Rad et al., 2024; Weber et al., 2025).

The implementation of AI Real-Time Feedback Assistance in learning at STAI Nuruddhaham Sumenep shows a concrete innovation in responding to the classic problems that have been hampering the development of students' writing skills. In the context of English language learning, students often have difficulty in recognizing and correcting errors in grammar, sentence structure, and the arrangement of ideas in their writing (Hendrawati, 2018). This is exacerbated by lecturers' limited time to provide thorough and personalized feedback to all students. Thus, the implementation of an AI-based automated feedback system is a strategic step to address these challenges systematically and sustainably (Kulkov et al., 2024). During the learning process, the implementation was carried out by dividing students into two groups: experimental and control. The experimental group gets access to AI-based real-time feedback technology such as Instatext or similar applications, which instantly provides corrections and writing suggestions as students type. Meanwhile, the control group continued to use the traditional approach with feedback from lecturers provided manually and periodically.

This process was carried out in a structured English class, with writing tasks designed in stages and evaluated through pretests and posttests. In practice, students in the experimental group found the learning experience more interactive and responsive. As they wrote, they received immediate notifications of syntax errors, poor vocabulary choices, or incoherent paragraph structures. This allowed the revision process to take place simultaneously, rather than post-production as is common in traditional learning models. As a result, not only does the quality of writing improve, but also students' reflection skills and learning independence are encouraged. Furthermore, this implementation also shows efficiency in the use of teaching time. Lecturers can focus more on coaching content and argumentation aspects, while technical corrections are assisted by the AI system.

The effectiveness of this approach is statistically proven, with a significant increase in writing scores in the experimental group compared to the control. This is proof that the integration of technology in learning is not just a trend, but an urgent pedagogical need, especially in Islamic-based higher education institutions such as STAI Nuruddhaham which is transforming towards a modern learning model and adaptive to the development of educational technology. The discussion in this study underscores the urgency of applying artificial intelligence (AI)-based technology as a solution to the limitations of traditional teaching models that have hindered the development of students' writing skills. Using a robust experimental approach, the authors successfully demonstrate that the use of Real-Time Feedback Assistance can significantly improve the quality of students' writing. The instant feedback provided by AI provides pedagogical advantages that conventional methods cannot match: students can immediately identify linguistic errors, correct argument structure, and improve expression independently. This fosters learning autonomy while

reducing dependence on the lecturer as the sole source of evaluation. Furthermore, the discussion of this research also critically touches on the technical and pedagogical aspects of AI implementation.

The researcher not only describes the success of the model, but also raises potential challenges such as technological resistance, dependence on automated systems, and the need for digital training for students and lecturers. This shows that the authors have a comprehensive understanding of the context of technology implementation in higher education, and do not solely focus on statistical data as an indicator of success. By quantitatively comparing the results between the experimental and control groups, which showed significant improvement in the group using AI. This research also empirically substantiates its claims. Interestingly, the findings show a critical awareness of the importance of synergy between technology and pedagogy. AI is not positioned as a substitute for teachers, but rather as a tool that enriches teaching interventions and accelerates the learning process. This approach is in line with Vygotsky's Zone of Proximal Development theory, where technology acts as a mediator that helps students achieve higher academic performance. As such, this journal is not only practically relevant for educational institutions looking to improve their students' writing competencies, but also contributes to the theoretical discourse on the role of AI in competency-based education.

CONCLUSION

The experimental group (AI Real-Time Feedback Assistance) showed a significant improvement in writing skills after the treatment compared to the results in the control group. The use of AI Real-Time Feedback Assistance is effective in improving students' writing skills. This finding confirms that instant feedback provided by AI technology is able to help students recognize errors, improve sentence structure, and increase the coherence and vocabulary of their writing more effectively than traditional methods. The integration of AI in writing learning should be widely implemented in educational institutions, especially in learning English or other subjects that involve writing skills. Training for teachers is important so that they can utilize AI technology optimally, as well as guide students in understanding and following up on the feedback provided by the system. Technology-based curriculum development needs to be considered to make learning more adaptive to digital developments and 21st century skill needs. Continuous evaluation is also needed to ensure the long-term effectiveness of using AI in educational contexts as well as adapting AI systems to students' specific needs.

REFERENCE

- Alshafie, M., Agha, L. Y., Nahass, L., Alameer, M. B., Samaan, J., Soqia, J., & Mohsen, S. (2025). Enhancing skills for scientific writing: A mixed-methods study at the faculty of health sciences, damascus university. *International Journal of Educational Research Open*, 9, 100451. <https://doi.org/10.1016/j.ijedro.2025.100451>
- Asadi, M., Ebadi, S., & Mohammadi, L. (2025). The impact of integrating ChatGPT with teachers' feedback on EFL writing skills. *Thinking Skills and Creativity*, 56, 101766. <https://doi.org/10.1016/j.tsc.2025.101766>
- Etaat, F. (2025). AI-based assessment of students' writing skill progress: Implementing "Artificial neural network modeling" vs. "Time series prediction." *International Journal of Educational Research*, 131, 102575. <https://doi.org/10.1016/j.ijer.2025.102575>
- Goshu, K. C., & Gebremariam, H. T. (2024). Revisiting writing feedback: Using teacher-student writing conferences to enhance learners' L2 writing skills. *Ampersand*, 13, 100195. <https://doi.org/10.1016/j.amper.2024.100195>
- Han, Y., Kim, H. B., & Park, S. (2021). The Roles of Nutrition Education and Food Vouchers in Improving Child Nutrition: Evidence from a Field Experiment in Ethiopia. *Journal of Health Economics*, 80, 102545. <https://doi.org/10.1016/j.jhealeco.2021.102545>
- Hendrawati, N. (2018). An Analysis on Students' Errors in Writing Sentence Patterns. *Loquen: English Studies Journal*, 11(1), Article 1. <https://doi.org/10.32678/loquen.v11i01.1036>
- Jiang, L., Liang, F., & Wu, D. (2024). Effects of technology-aided teaching mode on the development of CT skills of EFL students in Higher Vocational Colleges: A case study of English

- argumentative writing. *Thinking Skills and Creativity*, 53, 101594. <https://doi.org/10.1016/j.tsc.2024.101594>
- Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of Artificial Intelligence powered digital writing assistant in higher education: Randomized controlled trial. *Heliyon*, 7(5). <https://doi.org/10.1016/j.heliyon.2021.e07014>
- Onrubia, J., & Engel, A. (2012). The role of teacher assistance on the effects of a macro-script in collaborative writing tasks. *International Journal of Computer-Supported Collaborative Learning*, 7(1), 161–186. <https://doi.org/10.1007/s11412-011-9125-9>
- Rad, H. S., Alipour, Rasoul, & Jafarpour, A. (2024). Using artificial intelligence to foster students' writing feedback literacy, engagement, and outcome: A case of Wordtune application. *Interactive Learning Environments*, 32(9), 5020–5040. <https://doi.org/10.1080/10494820.2023.2208170>
- Sidikova, M., & Axmedova, M. (2025). THE ROLE OF ERROR CORRECTION IN IMPROVING ENGLISH WRITING SKILLS. *Журнал академических исследований нового Узбекистана*, 2(3), Article 3.
- Tajik, A. (2025). *Exploring the Role of AI-Driven Dynamic Writing Platforms in Improving EFL Learners' Writing Skills and Fostering Their Motivation*. Research Square. <https://doi.org/10.21203/rs.3.rs-5788599/v1>
- Tran, T. T. T., & Ma, Q. (2025). Technology-enhanced self-regulation training: A dynamic training model to facilitate second language Vietnamese learners' self-regulated writing skills. *System*, 130, 103625. <https://doi.org/10.1016/j.system.2025.103625>
- Weber, F., Wambsganss, T., & Söllner, M. (2025). Enhancing legal writing skills: The impact of formative feedback in a hybrid intelligence learning environment. *British Journal of Educational Technology*, 56(2), 650–677. <https://doi.org/10.1111/bjet.13529>
- Zhu, X., Sun, Y., Liu, Y., Xu, W., & Cheong, C. M. (2025). Towards a better understanding of integrated writing performance: The influence of literacy strategy use and independent language skills. *Assessing Writing*, 64, 100922. <https://doi.org/10.1016/j.asw.2025.100922>