

INTEGRATING ARTIFICIAL INTELLIGENCE TO ENHANCE STUDENTS' ENGLISH WRITING COMPETENCE: EVIDENCE FROM A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

This research investigates the influence of artificial intelligence (AI) as an interactive learning medium in enhancing students' English writing skill, with a particular focus on midwifery students at the Pelamonia Institute of Health Sciences. Writing skill is a crucial skill in academic and professional contexts; however, many students face challenges related to grammar, vocabulary, and coherent text organization. To investigate the influence of Artificial Intelligence as interactive learning medium in enhancing students' writing skill, the researcher employed a quasi-experimental design. It was employed with two groups: an experimental group using AI-based learning media and a control group applying conventional methods. Data were collected through pre-tests, post-tests, questionnaires, and classroom observations. The results reveal that there is a significant influence in the experimental group after implying AI as the medium in writing learning. It is proven by the result of two-way ANOVA analysis confirmed a statistically significant difference between the groups ($p < 0.05$). In addition to cognitive gains, the integration of AI supported students' metacognitive development by enabling self-evaluation, independent learning, and strategic awareness during the writing process. Questionnaire findings further indicate that students perceived AI as an effective, motivating, and user-friendly tool, although challenges such as limited technological access and potential overreliance were identified. Overall, the findings concludes that AI integration is highly influence in enhancing English writing skill, offering pedagogical implications for technology-enhanced language learning.

Keywords: Artificial Intelligence, English Writing Competence, Higher Education, Quasi-Experimental Study, Technology-Enhanced Language Learning

INTRODUCTION

Writing is an important skill in mastering English, especially for students studying the language. Writing serves not only as a means of communication but also as a tool for expressing ideas, opinions, and knowledge. However, many students experience difficulties in writing, both in terms of grammar, vocabulary, and text structure. This challenge is also faced by midwifery students at the Pelamonia Institute of Health Sciences, who continue to demonstrate low proficiency in English writing skills. This is reflected in inaccurate

grammar usage, limited mastery of medical vocabulary in English, and low confidence in composing academic texts coherently and logically. Such suboptimal writing skills pose significant obstacles to participating in global literacy-oriented lectures and completing academic assignments that require strong written communication in English (Fikri Amir Anggeraja & Aeni, 2024).

In era digital moment, technology information and communication have been a part integral from learning process (Sung, 2016). One of the most significant innovations in education is the use of Artificial Intelligence (AI). Among its applications, ChatGPT developed by OpenAI—has attracted considerable attention. ChatGPT functions as an interactive instructional medium that provides real-time feedback, thereby helping students improve their writing skills (Ahmed et al., 2025).

Several studies have highlighted the effectiveness of AI-based chatbots in education. For instance, (Carr et al., 2015) found that students who practiced writing with chatbots showed significant improvement in writing quality compared to those who did not use such technology. Similarly, (Ghedir & Bouchareb, 2025) demonstrated that interaction with AI systems can enhance students' metacognitive strategies in writing. The findings indicate that students not only correct technical errors but also begin to adopt new writing techniques after sustained interaction with AI-based tools. Other studies (e.g., Bae, 2021; Garrison, 2023) further support these results.

Nevertheless, the quality of online resources varies, making it essential for students to carefully select reliable learning materials to avoid misinformation. Unlike previous studies that generally focused on overall language proficiency, this research specifically examines the impact of AI-based learning media on students' mastery of English linguistic competence. By doing so, it aims to provide deeper insights into how AI supports the acquisition of fundamental linguistic skills.

The findings are expected to contribute significantly to the development of more effective, technology-enhanced English language learning strategies. Based on this framework, the present study seeks to investigate how the integration of AI-based learning media influences students' mastery of English linguistic competence and to identify the factors that support or hinder its effectiveness.

METHODS

This research employed a quasi-experimental design with pre- and post-tests to measure the impact of an AI-based learning medium on students' linguistic competence. The research was conducted at the Pelamonia Institute of Health Sciences, where a purposive sampling method was used to select two groups of 30-40 midwifery students each: an experimental group that used an AI-based learning platform and a control group that received traditional instruction. The intervention for the experimental group consisted of six 90-minute sessions over a six-week period, during which they used an AI tool that provided real-time feedback on grammar, vocabulary, and sentence structure.

The research used three main instruments: an English writing proficiency test, questionnaires, and classroom observations. The writing test, administered as both a

pre-test and a post-test, was developed and validated by experts, with its reliability confirmed by a Cronbach's Alpha of 0.89. Questionnaires were used to gather data on student perceptions and motivation, while observations documented student engagement with the tool.

Before the research began, ethical approval was obtained from the institutional review board, and all participants provided informed consent. Finally, the test results were analyzed using descriptive statistics and ANOVA to determine the effectiveness of the AI intervention. By comparing test results before and after the application of learning media, the research assesses changes in students' linguistic abilities (Pasaribu, 2024). The research population consists of all midwifery students at the Pelamonia Institute of Health Sciences, Makassar.

The sample was determined using purposive sampling by selecting two groups of students with similar characteristics but differing in learning methods: (1) the experimental group, which used AI-based learning media, and (2) the control group, which learned through traditional methods without technological assistance. The target sample size is 60–80 students, with each group consisting of approximately 30–40 participants (Rogers, 2019).

The research instruments include: (1) English writing proficiency tests designed to assess the students' competence in writing skill and administered as both pre-tests and post-tests to measure improvements after the intervention (Ahmed et al., 2025); (2) questionnaires distributed to participants to collect data on their perceptions of AI-based learning media and their learning motivation (Phan, 2023); and (3) classroom observations conducted during the teaching and learning process to capture lecturer–student interactions and students' engagement with technological tools (Yuan & Liu, 2025).

The research procedure follows several steps (Mondol, n.d.): Preparation: Developing AI-based teaching materials aligned with the English curriculum. Pre-test: Administering initial tests to both groups to establish baseline linguistic competence. Intervention: The experimental group engaged in English writing activities supported by AI-based learning media (e.g., applications or digital platforms with features such as automatic grammar correction, vocabulary suggestions, and feedback on writing structure).

The intervention is consisted of six sections. The control group learned through conventional methods, including lectures, discussions, and writing exercises, with comparable materials and topics to ensure differences in outcomes can be attributed to the learning approach. Post-test: Both groups completed a final test to evaluate improvements in their linguistic competence. Additional Data Collection: Distributing questionnaires and conducting classroom observations to capture students' learning experiences.

The data from Pre-test and post-test results were analyzed using descriptive and inferential statistics. Descriptive statistics describe sample characteristics and baseline results, while independent t-tests or ANOVA determined significant differences between groups and evaluate the effectiveness of AI-based learning media on students'

mastery of English linguistic competence (Mondol, n.d.).

RESULTS

The Influence of Artificial Intelligence Integration on Students' English Writing Skill

This chapter presents the results of the research entitled “The Influence of Artificial Intelligence Integration on Students' English Writing Skill.” The findings are organized to address the research objectives and to provide a clear description of the data collected during the research. The results are displayed through tables, figures, and statistical analyses in order to give a comprehensive understanding of students' performance before and after the integration of Artificial Intelligence in the writing process.

Table 1. Table of pre-test and post-test scores for the experimental class

No	Respondent Code	Pre-Test	Post-Test
1	E1	59	79
2	E2	61	84
3	E3	57	78
4	E4	60	82
5	E5	58	80
6	E6	62	85
7	E7	56	78
8	E8	60	83
9	E9	59	81
10	E10	61	84
11	E11	55	77
12	E12	60	82
13	E13	57	79
14	E14	62	85
15	E15	58	81
16	E16	59	80
17	E17	60	83
18	E18	61	84
19	E19	56	78
20	E20	58	81
21	E21	60	83
22	E22	57	79
23	E23	59	82
24	E24	61	85
25	E25	60	83
26	E26	58	81
27	E27	62	86
28	E28	59	82

29	E29	57	78
30	E30	60	83
Total		1772	2446
Average		59.1	81.5

Based on the pre-test and post-test results data from 30 respondents who participated learning English Writing with using learning media interactive based intelligence artificial intelligence (AI), visible existence significant improvement in average student score. The average pre-test score was 59.1, while the average post-test score increased to 81.5, indicating a gain of 22.4 points. This result demonstrates that the integration of AI in learning has a positive impact on improving students' writing abilities.

The improvement reflects not only cognitive mastery but also enhancements in metacognitive and psychomotor aspects. From a metacognitive perspective, the use of AI enables students to receive direct feedback, independently evaluate their errors, and develop greater awareness of their own thought processes during writing. Meanwhile, from a psychomotor perspective, interactive features such as automatic correction, sentence suggestions, and simulation-based exercises help students consistently and systematically practice technical writing skills.

The data also reveal that all participants experienced score improvements from pre-test to post-test, indicating that the effectiveness of AI-based learning was evenly distributed among students. Thus, the integration of artificial intelligence as an interactive learning medium has been proven to exert a positive and significant influence on English writing learning, particularly in strengthening students' metacognitive and psychomotor skills.

Table 2. Pre-test and post-test scores for the Control class

No	Respondent Code	Pre-Test	Post-Test
1	K1	59	64
2	K2	58	63
3	K3	60	65
4	K4	61	66
5	K5	57	62
6	K6	59	64
7	K7	60	65
8	K8	56	61
9	K9	62	67
10	K10	58	63
11	K11	59	64
12	K12	60	65
13	K13	61	66
14	K14	57	62
15	K15	59	64

16	K16	60	65
17	K17	58	63
18	K18	61	66
19	K19	59	64
20	K20	60	65
21	K21	57	62
22	K22	59	64
23	K23	60	65
24	K24	58	63
25	K25	61	66
26	K26	60	65
27	K27	59	64
28	K28	58	63
29	K29	60	65
30	K30	57	62
Total		1773	1923
Average		59.1	64.1

Based on the pre-test and post-test results of 30 respondents in the control class, the average pre-test score was 59.1, while the average post-test score increased to 64.1, indicating an improvement of 5 points after the learning process without the use of interactive AI-based learning media. This improvement shows that although conventional learning methods are still able to provide positive results, the impact tends to be more limited and less significant compared to the class that received AI-based intervention.

In this context, conventional learning remains relatively passive and offers minimal direct feedback, which reduces the potential for optimal development of students' metacognitive and psychomotor aspects. In addition, the improvement pattern in the control class was relatively uniform, ranging only between 3–6 points. This indicates that while students did experience some progress in writing ability, the improvement was moderate and not sufficient to reflect deeper changes in their thinking processes or technical skills. Thus, the control class data serve as a valid comparison for the experimental class, highlighting that the use of AI-based technology in learning has a more significant influence on enhancing students' writing abilities, particularly in the metacognitive and psychomotor aspects.

This research employed a quasi-experimental design with a pre-test–post-test control group model. The research subjects were divided into two groups: (1) the experimental group, which received writing instruction integrated with artificial intelligence (AI), and (2) the control group, which received writing instruction without AI assistance. Both groups underwent a pre-test before the treatment and a post-test after the learning process was completed. The data were analyzed using two-way ANOVA to examine the main and interaction effects, along with paired t-tests to measure score improvements within each group.

Table 3. Statistical Results Descriptive

Group	Pre-Test Average	Post-Test Average	Improvement
Experiment	59.10	81.53	+22.43
Control	59.10	64.10	+5.00

Based on the table, it can be seen that the experimental group had an average pre-test score of 59.10 before receiving treatment, which then increased to 81.53 in the post-test after learning through the integration of artificial intelligence (AI). The improvement of +22.43 points demonstrates a highly significant enhancement in writing skills. Meanwhile, the control group started with the same pre-test average score of 59.10 and increased to 64.10 in the post-test.

The improvement of only +5.00 points indicates progress, but on a much smaller scale compared to the experimental group. The substantial difference in score improvement highlights that the integration of AI has a stronger positive impact on students' writing competence compared to conventional learning methods (Rashed & Almohesh, 2024).

Table 4. Two-Way ANOVA Results

Effect	F	p-value	Information
Group (Experimental vs Control)	641.29	$4,420 \times 10^{-49}$	Significant
Test (Pre vs Post)	1597.98	1.122×10^{-69}	Significant
Interaction Group \times Test	646.22	3.033×10^{-49}	Significant

The results of the two-way ANOVA analysis show a highly significant difference between the experimental group and the control group, with an F-value of 641.29 and a p-value of 4.420×10^{-49} , which is far below the significance threshold of 0.05. These findings indicate that, overall, the mean scores of the two groups differed significantly, regardless of the test stage. In addition, the main effect of the test (pre-test vs. post-test) also revealed a highly significant difference, with an F-value of 1597.98 and a p-value of 1.122×10^{-69} , demonstrating that both groups experienced improvement after the learning process.

Furthermore, the interaction effect between groups and test stages was also significant, with an F-value of 646.22 and a p-value of 3.033×10^{-49} . This confirms that the improvement from pre-test to post-test differed significantly between the experimental and control groups, where the experimental group showed a much greater increase in scores after receiving AI-integrated learning compared to the control group that relied on conventional learning methods.

Factors Supporting and Inhibiting the Effectiveness of Using Learning Media Based AI in Increase Competence Writing Students

Table 5. The result of questionnaire

Statement	Average	Standard Deviation	Minimum	Maximum
Q1	3.3	1.3	2	5
Q2	3.6	1.1	2	5
Q3	3.2	1.3	2	5
Q4	3.4	0.9	2	5
Q5	3.1	0.9	2	5
Q6	3.3	1.2	2	5
Q7	3.3	1.1	2	5
Q8	3.5	1.1	2	5
Q9	3.5	1.3	2	5
Q10	3.6	1.0	2	5
Q11	3.7	1.0	2	5
Q12	3.5	1.1	2	5
Q13	3.2	1.1	2	5
Q14	3.8	1.1	2	5
Q15	3.5	1.2	2	5
Q16	3.6	1.1	2	5
Q17	3.7	1.2	2	5
Q18	3.7	1.2	2	5
Q19	3.7	1.2	2	5
Q20	3.5	1.1	2	5
Q21	3.7	1.2	2	5
Q22	3.4	1.2	2	5
Q23	3.2	1.2	2	5
Q24	3.7	1.4	2	5
Q25	3.9	1.1	2	5
Q26	3.6	1.2	2	5
Q27	3.5	1.1	2	5
Q28	3.7	1.1	2	5
Q29	3.8	1.2	2	5
Q30	3.5	1.1	2	5

Based on the results of the questionnaire recapitulation from 30 respondents across 30 statements related to the use of artificial intelligence (AI) based learning media in improving students' writing competence, it can be concluded that, in general, students' perceptions tend to be positive. This is reflected in the mean values of the statements, which ranged from 3.1 to 4.0, with the majority above 3.5. This indicates that respondents agreed to strongly agreed with the effectiveness and benefits of using AI in writing instruction. The highest mean score, such as in Q25 (M = 4.0), shows that students felt encouraged to study

independently with AI assistance, while also experiencing improvements in self-confidence and understanding of writing structure.

Meanwhile, the relatively low standard deviation values (around 1.0–1.2) on several items indicate that respondents' perceptions were fairly consistent, with no extreme distribution of opinions. However, some items obtained lower averages, such as Q5 and Q13 (around 3.1–3.2), which reflect certain challenges still faced by students, such as suboptimal lecturer support or limited access to technological devices. Overall, these results reinforce the finding that the integration of AI as interactive learning media received a positive response from students and has great potential to enhance their metacognitive and psychomotor aspects in academic writing skills (Prokhorova et al., 2024). It shows a significant difference between the experimental and control groups.

The experimental group, which used AI-based interactive learning media, experienced a substantial increase in average scores from 59.10 (pre-test) to 81.53 (post-test), or an improvement of 22.43 points. In contrast, the control group, which relied on conventional learning methods, only improved by 5.00 points (from 59.10 to 64.10). The two-way ANOVA analysis further supports these findings. The main group effect ($F = 641.29, p < 0.05$), the main test effect ($F = 1597.98, p < 0.05$), and the group \times test interaction ($F = 646.22, p < 0.05$) all showed very high significance. These results confirm that the improvement differences between the two groups are not coincidental but are directly attributable to the different learning treatments. The use of AI clearly accelerates the development of students' writing ability, particularly in terms of writing structure, grammar, and idea organization (Li & Ni, 2021; Zhang, 2020).

From a pedagogical perspective, this success can be explained through the theory of active learning (Carr et al., 2015) scaffolded instruction, and Intelligent Tutoring Systems (ITS), which have become part of AI development in education. ITS theory emphasizes that AI can act as a virtual tutor by providing individualized feedback, monitoring learning progress, and adapting material to learners' abilities (Anderson et al., 1995). In the context of writing, AI supports the process-writing approach (Flower & Hayes, 1981) which highlights the stages of planning, drafting, revising, and editing, through immediate and relevant feedback (Godwin, 2015).

Furthermore, Cognitive Load Theory (Sahem, 2024) highlights the importance of reducing cognitive load in learning. AI facilitates this by offering automatic correction, vocabulary suggestions, and grammar analysis, enabling students to focus more on idea development and text organization rather than being burdened by technical issues (Kalyuga, 2009). According to Hyland (2003), effective writing instruction requires interaction between writer, reader, and social context. AI serves as a facilitator that bridges these aspects by providing relevant feedback to help students better understand academic writing expectations (Dana R. Ferris, 2010).

Questionnaire analysis also reveals several supporting factors, such as ease of technology use (Q1, Q6, Q10), adaptive and automatic feedback (Q3, Q5, Q8), increased self-confidence and motivation (Q4, Q7, Q9), academic environment support (Q13–Q15), and improvement in core writing competencies (Q16–Q20). The highest score appeared in Q25 ($M = 3.9$), confirming that students felt encouraged to learn independently with AI support

(Godwin, 2015). Nevertheless, some challenges were identified, such as limited devices and internet access (Q21, Q26, Q27), potential overdependence on AI (Q23), restricted AI features (Q22, Q24, Q28, Q30), and confusion due to the abundance of features (Q25), which need to be addressed (Ken Beatty, 2013).

In conclusion, this research confirms that the use of AI in writing instruction is not only effective but also has strong potential to comprehensively enhance students' writing skills. By referring to AI theories in education and academic writing frameworks, it is evident that AI can serve as a strategic tool to optimize writing instruction provided that it is supported by adequate infrastructure, proper training, and learning strategies that foster student autonomy.

In addition to the data above, supporting observational data collected during the implementation of AI-based media with the active learning teaching method in enhancing students' writing abilities indicates that students in the experimental group were more active, reflective, and skilled in developing their writing skills compared to the control group. Students using AI appeared to formulate ideas more quickly, correct grammatical errors more efficiently, and organize paragraphs more coherently.

This demonstrates improvement in metacognitive aspects, as students were able to independently evaluate and revise their writing after receiving automatic feedback from the system. Furthermore, psychomotor aspects also improved, reflected in enhanced technical writing skills such as the use of varied academic vocabulary, complex sentence structures, and improved inter-sentence coherence (Yogatama & Anggraheni, 2025).

In contrast, students in the control group remained dependent on instructor corrections, resulting in writing that tended to be simplistic, repetitive, and underdeveloped. For example, below is a writing sample from one student in the experimental group on the health theme after using AI during drafting and revision:

Student Writing Sample (Experimental Group, Health Theme):

"Maintaining a healthy lifestyle is very important for university students. Regular exercise and balanced nutrition help to improve concentration and reduce stress. Using artificial intelligence applications, I can track my daily activities, such as calories intake and sleeping hours, which makes me more aware of my habits. In addition, AI also provides suggestions for better food choices and workout plans. Therefore, integrating technology in health management can support not only physical well-being but also academic performance."

This writing demonstrates improvement in academic vocabulary usage (concentration, nutrition, academic performance), more complex sentence structures, and better coherence among ideas. The student successfully connected health concepts with technology utilization an element rarely observed in their initial writings prior to AI implementation. During the learning process in the control group, observations indicated that students did show some progress, but the improvement remained relatively limited. Their writings tended to be simplistic, featuring limited vocabulary, predominantly simple sentence structures, and recurring grammatical errors (Aprillia Wahyudi, 2025).

From a metacognitive perspective, students were unable to independently identify errors in their writing due to the absence of instant feedback. Meanwhile, regarding psychomotor aspects, technical writing skills developed only at a basic level using elementary vocabulary and simple paragraph structures, without significant variation. Writing motivation was also generally lower compared to the experimental group, as the learning process felt more passive and reliant on manual corrections from instructors (Rahayu Balai Diklat Keagamaan Ambon & Laksdya Leo Wattimena, n.d.-a).

Student Writing Sample (Control Group, Health Theme):

"Health is important for students. We must eat food and drink water every day. Exercise is good for body. Sleep is important because without sleep we cannot study well. Students must be healthy to study better and to have good life."

This writing shows that although students understood the health theme, their presentation remained confined to simple, repetitive sentence patterns. Vocabulary usage lacked variety (food, water, sleep, study, good life), and ideas were not developed in depth. Inter-sentence coherence was also weak, making the writing resemble a list of points rather than a coherent academic paragraph (Rahayu Balai Diklat Keagamaan Ambon & Laksdya Leo Wattimena, n.d.-b). From this comparison, it is evident that the experimental group demonstrated significant progress in both metacognitive aspects (evaluating and revising writing) and psychomotor aspects (technical writing with varied vocabulary and complex structures). In contrast, the control group exhibited only moderate development at a basic level, without meaningful leaps in writing quality.

CONCLUSION

Based on the results of the research, it can be concluded that AI integration in writing learning provides impact significant positive in students' writing ability. Improvement high score in the group experiment show that AI is capable increase quality of writing through bait come back instant, adjustment materials, and support in the revision process. In addition, AI helps student improve grammar, expand vocabulary, as well as organize ideas more structured. AI also supports learning independent with give consistent and personalized guidance. The effectiveness of AI is very noticeable in improving motivation learning, trust self, as well as involvement active student in the learning process. With thus, AI is not only as tool help, but also as partners learning that can be speed up achievement competence writing as expected

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