

Analyzing the Effectiveness of Artificial Intelligence as a Writing Assistant for Enhancing the Academic Writing Skills of Vocational Students

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ABSTRAK

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Keywords:
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This study aims to analyze the effectiveness of using Artificial Intelligence (AI) as a writing assistant to improve the academic writing skills of vocational students. The study employed a mixed methods approach with a quasi-experimental pretest-posttest control group design involving 48 students from Politeknik Aceh Selatan. The research began with a pretest, followed by an intervention in which AI was utilized as a writing assistant in the experimental group, while the control group received conventional writing instruction. After the posttest, observations, interviews, and focus group discussions were conducted to strengthen the quantitative findings. The results showed that the experimental group's mean score increased from 66.20 to 85.95, which was substantially higher than the control group's improvement from 66.75 to 75.62. The Wilcoxon Signed-Rank Test and Mann-Whitney U Test yielded a significance value of 0.000 ($p < 0.05$), indicating statistically significant differences. Interview findings also revealed that 96% of the students perceived AI as highly effective because it helped them generate ideas, organize writing structures, improve grammar, enrich academic vocabulary, and enhance their confidence in academic writing. Therefore, AI has proven to be an effective writing assistant for academic writing instruction while maintaining academic integrity and the originality of scholarly work.

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1. Introduction

Academic writing competence is an essential skill for vocational students because it serves as the primary means of presenting internship reports, final projects, and the results of applied studies in a systematic and scientific manner [1,2]. However, in instructional practice, many students continue to experience difficulties in generating ideas, organizing coherent paragraph structures, maintaining cohesion and coherence, and using academic language in accordance with scholarly conventions. These challenges directly contribute to the low quality of students' academic writing [3]. The rapid advancement of Artificial Intelligence (AI) has introduced new opportunities in writing instruction, particularly through its use as a writing assistant capable of supporting idea generation, paragraph



development, and language editing [4]. Several studies have demonstrated that AI has considerable potential to support the writing process while emphasizing the need for empirical evidence and responsible pedagogical implementation [5].

Academic writing is a fundamental competency for university students, including those enrolled in vocational education programs. Effective academic writing requires mastery of scientific writing conventions, grammatical accuracy, critical thinking, and the ability to construct logical and well-organized arguments. Nevertheless, many students still struggle to develop ideas systematically and maintain coherence across paragraphs [6,7].

Recent advances in AI have created new opportunities for writing instruction, particularly through generative language models such as ChatGPT, which can assist students in drafting, outlining, revising, and providing feedback on their writing. Several meta-analyses and empirical studies have reported that AI has the potential to improve writing quality, especially when its use is supported by appropriate instructional guidance and AI literacy [8-10]. Experimental studies conducted in higher education have also found significant improvements in essay quality and student satisfaction when AI is integrated as a writing assistant [11].

Despite its potential to accelerate revision and idea generation, the adoption of AI also presents several challenges, including the risk of overreliance, inaccuracies in AI-generated content, and potential violations of academic integrity when clear usage policies are absent [12,13]. In vocational education, where learning is strongly practice-oriented, the effectiveness of AI as a writing assistant is particularly relevant. The limited body of research involving vocational students highlights the need for empirical studies examining the impact of AI on technical writing skills, procedural clarity, and the scientific communication of practical work. Therefore, this study aims to evaluate the effectiveness of AI in improving the academic writing skills of vocational students while proposing ethical and pedagogical guidelines for its responsible implementation.

A. Research Questions

1. How effective is Artificial Intelligence (AI) in improving the academic writing skills of vocational students?
2. Which aspects of academic writing demonstrate significant improvement following the use of AI as a writing assistant?

B. State of the Art and Novelty

The use of Artificial Intelligence (AI) as a writing assistant in higher education has developed rapidly alongside advances in generative AI technologies. Recent studies have demonstrated that AI can help students improve the quality of their academic writing, particularly in terms of grammatical accuracy, idea development, paragraph coherence, and logical organization. The effectiveness of AI lies in its ability to provide immediate feedback, recommend improvements to writing structure, and suggest more appropriate vocabulary, thereby enabling a more systematic, continuous, and effective revision process [14].

Novelty, unlike previous studies that have primarily focused on general higher education contexts, this research specifically investigates the effectiveness of AI as a writing assistant in vocational higher education, where academic writing is closely integrated with practical and technical competencies. Furthermore, this study employs a mixed-methods approach using a quasi-experimental pretest-posttest control group design, complemented by observations, interviews, and focus group discussions (FGDs), to provide a more comprehensive evaluation of AI-assisted writing. In addition to measuring improvements in students' academic writing performance, the study also proposes ethical and pedagogical guidelines for the responsible integration of AI into vocational education, thereby contributing both empirical evidence and practical recommendations for AI-enhanced academic writing instruction.

Table 1. State of The Art and Novelty

No	Author(s)	Research Title	Key Findings	Year
1.	Wang et al.	The effect of ChatGPT on students' learning performance, perceptions, and higher-order thinking: a meta-analysis.	ChatGPT has been shown to improve learning outcomes and conceptual understanding by delivering timely and responsive assistance. However, its effectiveness decreases when students rely on it passively rather than engaging actively in the learning process. Overall, ChatGPT is an effective educational tool when used responsibly and with appropriate pedagogical guidance.	2025
2.	Alvizo JB	The impact of ChatGPT on students' academic writing performance: a meta-analytic study.	Artificial Intelligence (AI) has been shown to enhance the quality of academic writing by improving text structure, coherence, and grammatical accuracy. Nevertheless, excessive reliance on AI may reduce students' critical thinking and foster dependency in the absence of appropriate instructional support. Consequently, the effectiveness of AI depends on its responsible and pedagogically guided use.	2025
3.	Ekowijayanto M et al.	Impact of ChatGPT on students' learning strategies and critical thinking development.	ChatGPT has the potential to enhance learning strategies and foster critical thinking by enabling rapid access to information and supporting the construction of well-structured arguments. Nevertheless, excessive dependence on ChatGPT may diminish students' learning autonomy and limit the depth of critical analysis. Therefore, its educational effectiveness depends on balanced and responsible use within an appropriate pedagogical framework.	2025
4.	Puteri CG et al.	Using ChatGPT as a writing assistant: essay quality development among Indonesian EFL university students.	The integration of ChatGPT into EFL writing instruction has been shown to enhance the quality of students' essays, particularly with respect to organizational structure and grammatical accuracy. Nevertheless, the implementation of clear ethical guidelines is essential to prevent excessive reliance on AI and to foster students' autonomy in academic writing.	2024
5.	Taufikin et al.	Enhancing undergraduate academic writing through artificial intelligence assistance.	Artificial Intelligence (AI) has been shown to improve the quality of academic writing by enhancing linguistic accuracy and textual coherence. Nevertheless, the implementation of clear ethical	2024

		guidelines is crucial to maintain the originality of scholarly work and to prevent students from becoming overly dependent on AI-assisted writing tools.	
6.	Bhuiyan	Adoption of ChatGPT for students' learning effectiveness: opportunities and ethical challenges.	2024
		ChatGPT has been shown to improve learning effectiveness by facilitating rapid access to information and providing substantial support for academic writing. Nevertheless, its adoption raises concerns regarding plagiarism, excessive dependence on AI, and potential algorithmic bias. Therefore, the effective integration of ChatGPT into higher education requires well-defined institutional policies and comprehensive digital literacy to promote ethical and responsible use.	

The integration of Artificial Intelligence (AI) as a writing assistant in higher education has the potential to enhance the quality of vocational students' academic writing. Through immediate feedback, structural recommendations, and appropriate vocabulary suggestions, AI effectively supports improvements in grammatical accuracy, idea development, and textual coherence. Moreover, when implemented ethically and responsibly, AI can help reduce the risk of plagiarism while preserving the originality of academic work. It also serves as a practical guide for both lecturers and students in producing high-quality academic writing in accordance with academic integrity standards.

II. Method

This study aims to improve the academic writing skills of vocational students through AI-assisted writing instruction using a quasi-experimental research design. The research procedures included the development of validated research instruments, the administration of a pretest, an AI-assisted writing intervention emphasizing the ethical use of AI, and a posttest. Quantitative data were analyzed using appropriate statistical tests, while qualitative data from interviews, focus group discussions (FGDs), and classroom observations were analyzed to explore students' learning experiences in greater depth. A total of 48 students from Politeknik Aceh Selatan voluntarily participated in the study. The research followed a systematic sequence of activities, beginning with instrument development and concluding with the dissemination of research findings through scholarly publication. The expected outcomes include empirical evidence regarding the effectiveness of AI in improving academic writing skills, the development of an ethical AI-assisted writing instruction model, and practical recommendations for the responsible integration of AI into vocational higher education.

To obtain a comprehensive understanding of the research problem, the study employed a mixed-methods approach. The qualitative component was used to explore the meanings and experiences of vocational students within their natural learning context through interviews, focus group discussions (FGDs), and classroom observations. The quantitative component examined the effects of the intervention by analyzing numerical data using statistical techniques to produce objective findings [15]. This combined approach provides a comprehensive evaluation of the effectiveness of AI-assisted academic writing instruction while offering deeper insights into students' strategies for using AI, its perceived benefits, its limitations, and the potential risks of overreliance on AI. Figure 1 illustrates the overall research procedure and workflow.

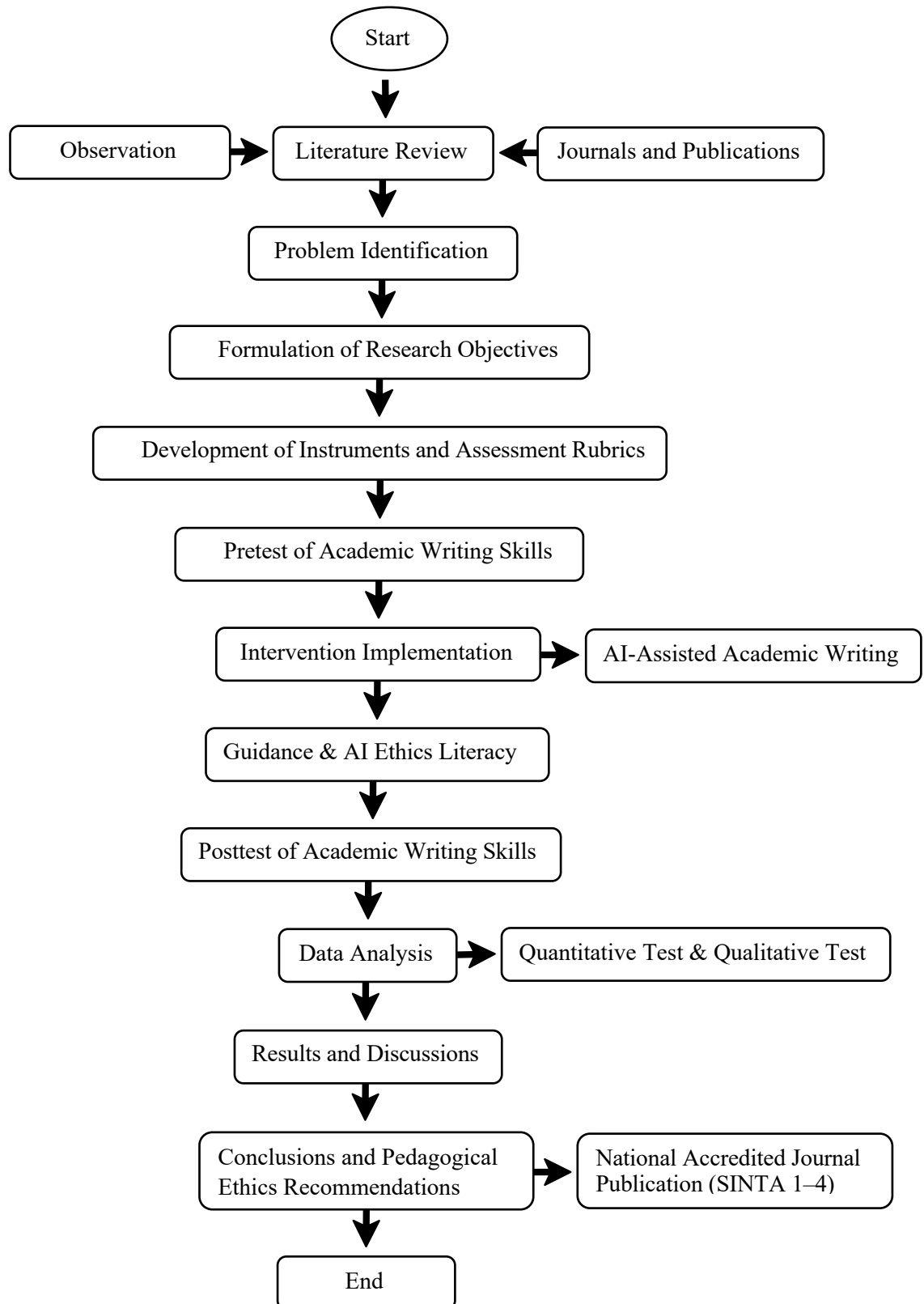


Fig 1. Research Workflow

This study is expected to contribute empirical evidence regarding the effectiveness of Artificial Intelligence (AI) in vocational higher education and to inform the development of ethical guidelines for its implementation. The findings are anticipated to support lecturers and students in integrating AI responsibly to enhance the quality of academic writing while preserving academic integrity, ensuring the originality of scholarly work, and promoting ethical AI-assisted writing practices.

III. Results and Discussions

This study demonstrates the effectiveness of Artificial Intelligence (AI) as a writing assistant in improving the academic writing skills of vocational students, as evidenced by significant improvements in pretest-posttest scores across writing organization, cohesion, linguistic accuracy, and clarity of ideas. Furthermore, the study develops an ethical AI-assisted writing instruction model, accompanied by a validated writing assessment rubric and practical recommendations for the responsible use of AI while safeguarding academic integrity.

The study aims to examine the effectiveness of using Artificial Intelligence (AI) as a writing assistant to improve the academic writing skills of vocational students. A pretest-posttest control group design was employed, in which the experimental group received AI-assisted academic writing instruction, while the control group received conventional instruction. Prior to the intervention, all participants completed a pretest to assess their initial academic writing ability. Following the completion of the AI-assisted learning intervention, the students completed a posttest to measure improvements in their academic writing performance.

A. Research Data Description

1. Respondent Characteristics

The respondents in this study consisted of 48 students from Politeknik Aceh Selatan, who were selected using a purposive sampling technique. The participants were divided equally into two groups: 24 students in the experimental group and 24 students in the control group. The respondents' characteristics are presented to provide an overview of the research participants and to ensure that both groups possessed relatively comparable baseline characteristics.

2. Description of the Experimental and Control Groups

This study involved two groups: an experimental group and a control group, each consisting of 24 students. The experimental group received AI-assisted writing instruction, in which Artificial Intelligence (AI) was utilized as a writing assistant throughout the academic writing process. In contrast, the control group received conventional writing instruction without the use of AI. Both groups completed a pretest before the intervention and a posttest after the intervention to measure and compare improvements in the students' academic writing skills.

B. Quantitative Analysis Results

1. Descriptive Statistics

Table 1. Pretest and Posttest Scores of the Experimental and Control Groups

No	Respondent	Score		No	Respondent	Score	
		Experimental Group Pretest (X)	Experimental Group Posttest (Y)			Control Group Pretest (X)	Control Group Posttest (Y)
1	ZF	62	85	1	AM	60	75
2	FS	65	86	2	MFAI	61	79
3	MS	60	85	3	HM	70	77
4	AM	64	86	4	AD	65	76
5	DS	72	86	5	RM	70	76
6	MFA	68	87	6	JB	70	77
7	IR	65	85	7	TA	66	70
8	NAK	63	87	8	NA	60	77
9	KS	72	86	9	TM	70	79
10	MF	70	88	10	BR	74	79
11	NS	72	86	11	MAR	71	78
12	KA	69	87	12	IW	70	77

No	Respondent	Score		No	Respondent	Score	
		Experimental Group Pretest (X)	Experimental Group Posttest (Y)			Control Group Pretest (X)	Control Group Posttest (Y)
13	NO	64	86	13	ADK	65	76
14	MFR	63	86	14	MD	60	75
15	EM	62	85	15	SA	65	70
16	MTA	72	86	16	NA	70	76
17	JH	63	85	17	FYA	65	69
18	EK	68	85	18	HH	70	75
19	SA	72	86	19	ATP	71	75
20	SW	70	87	20	RU	73	77
21	LA	66	86	21	AZ	69	76
22	PL	67	85	22	UM	65	75
23	KU	60	86	23	RR	60	76
24	EK1	60	86	24	RRM	62	75
Total		Σ^X 1589	Σ^Y 2063	Total		Σ^X 1602	Σ^Y 1815
Mean		66.20	85.95	Mean		66.75	75.62
Gain Score (Y-X)		19.75		Gain Score (Y-X)		8.87	

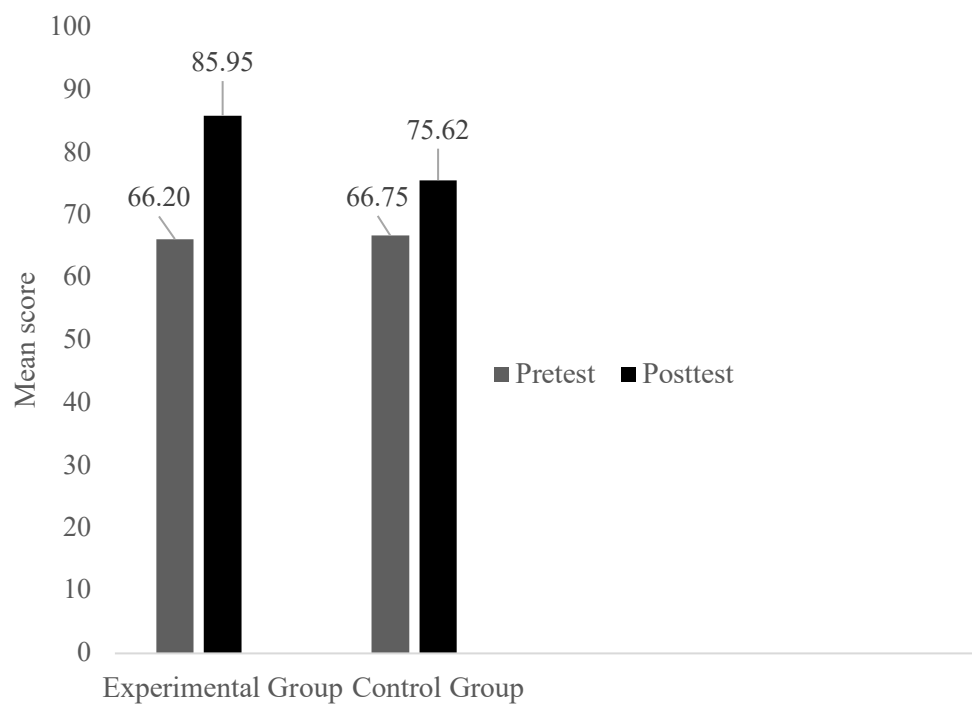


Fig 2. Comparison of Mean Pretest and Posttest Scores

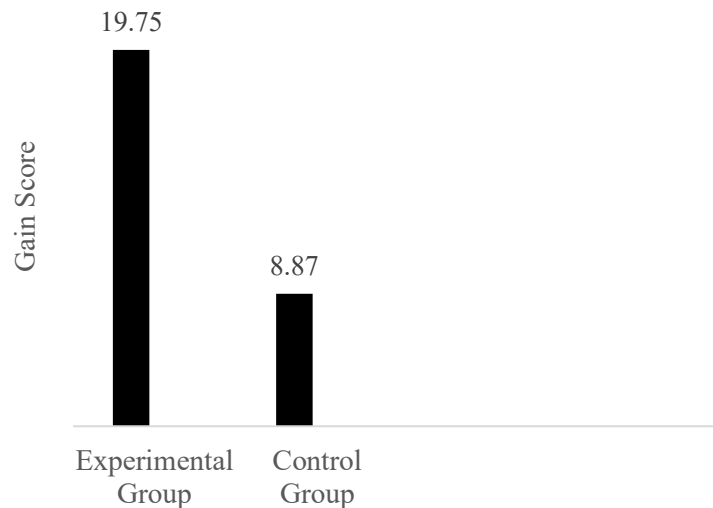


Fig 3. Comparison of Gain Scores

Based on the data presented in table 1, figure 2, and figure 3, the experimental group achieved a mean pretest score of 66.20, which increased to 85.95 on the posttest, resulting in a gain score of 19.75. In contrast, the control group's mean score increased from 66.75 to 75.62, yielding a gain score of 8.87. These findings indicate that both groups demonstrated improvements in academic writing performance following the instructional intervention; however, the improvement observed in the experimental group was substantially greater than that of the control group. Descriptively, these results suggest that the AI-assisted writing intervention implemented in the experimental group was more effective in enhancing students' academic writing performance than the conventional instruction received by the control group. Nevertheless, to determine whether the observed differences are statistically significant, inferential statistical analyses are required. These include the Wilcoxon Signed-Rank Test (for non-normally distributed data) or the Paired Samples t-Test (for normally distributed data) to examine within-group differences, followed by the Mann-Whitney U Test or the Independent Samples t-Test to compare the outcomes between the two groups.

Table 2. Descriptive Analysis of the Pretest and Posttest Scores of the Experimental and Control Groups (SPSS 25)

		Statistics			
		Experimental Group Pretest	Experimental Group Posttest	Control Group Pretest	Control Group Posttest
N	Valid	24	24	24	24
	Missing	0	0	0	0
Mean		66.20	85.95	66.75	75.62
Std. Error of Mean		.858	.165	.913	.538
Median		65.50	86.00	67.50	76.00
Mode		72	86	70	75 ^a
Std. Deviation		4.201	.806	4.475	2.634
Variance		17.650	.650	20.022	6.940
Range		12	3	14	10
Minimum		60	85	60	69
Maximum		72	88	74	79
Sum		1589	2063	1602	1815
a. Multiple modes exist. The smallest value is shown					

Based on the descriptive analysis presented in table 2, the mean pretest scores of the experimental group (66.20) and the control group (66.75) were relatively similar, indicating that the two groups had comparable baseline academic writing abilities prior to the intervention. Following the intervention, the mean posttest score of the experimental group increased to 85.95, whereas the control group achieved a mean score of only 75.62. Furthermore, the posttest standard deviation of the experimental group (0.806) was lower than that of the control group (2.634), suggesting that the learning outcomes of the experimental group were more homogeneous. Descriptively, the improvement in academic writing performance was substantially greater in the experimental group than in the control group. These findings indicate that the AI-assisted writing intervention implemented in the experimental group was more effective in improving students' academic writing performance than the conventional instructional approach used in the control group.

2. Test of Normality

Table 3. Results of the Shapiro-Wilk Normality Test (SPSS 25)

Tests of Normality							
	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Results	Experimental Group Pretest	.124	24	.200*	.914	24	.042
	Experimental Group Posttest	.271	24	.000	.840	24	.001
	Control Group Pretest	.225	24	.003	.895	24	.017
	Control Group Posttest	.281	24	.000	.828	24	.001
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Based on the results presented in table 3, the Shapiro-Wilk normality test revealed that the significance values were 0.042 for the experimental group's pretest, 0.001 for the experimental group's posttest, 0.017 for the control group's pretest, and 0.001 for the control group's posttest. All significance values were below the threshold of 0.05, indicating that neither the pretest nor the posttest data in either group were normally distributed. Therefore, the assumption of normality was not satisfied, and subsequent data analyses were conducted using nonparametric statistical tests.

C. Nonparametric Statistical Tests

1. Wilcoxon Signed-Rank Test

Table 4. Wilcoxon Signed-Rank Test (SPSS 25)

Test Statistics ^a	
	Experimental Group Posttest - Experimental Group Pretest
Z	- 4.293 ^b
Asymp. Sig. (2-tailed)	.000
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

Based on the results presented in table 4, the Wilcoxon Signed-Rank Test yielded a Z value of -4.293 with an Asymp. Sig. (2-tailed) of 0.000. Since the significance value was lower than the 0.05 threshold ($0.000 < 0.05$), a statistically significant difference was found between the pretest and posttest scores of the experimental group. These findings indicate that the intervention produced a significant improvement in students' learning outcomes. Therefore, the AI-assisted writing intervention implemented in the experimental group was demonstrated to be effective in enhancing students' academic writing skills.

Table 5. Wilcoxon Signed-Rank Test (SPSS 25)

Test Statistics ^a	
	Control Group Posttest - Control Group Pretest
Z	-4.294 ^b
Asymp. Sig. (2-tailed)	.000
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

Based on the results presented in table 5, the Wilcoxon Signed-Rank Test for the control group produced a Z value of -4.294 with an Asymp. Sig. (2-tailed) of 0.000. Since the significance value was lower than 0.05 ($0.000 < 0.05$), a statistically significant difference was observed between the pretest and posttest scores of the control group. These findings indicate that the conventional instructional process also resulted in a significant improvement in students' learning outcomes. Nevertheless, the improvement observed in the control group should be compared with that of the experimental group to determine the relative effectiveness of the AI-assisted writing intervention.

2. Mann-Whitney Test

Table 6. Mann-Whitney Test (SPSS 25)

Test Statistics	
	Skor
Mann-Whitney U	.000
Wilcoxon W	300.000
Z	-6.012
Asymp. Sig. (2-tailed)	.000
a. Grouping Variable: Group	

Based on the results presented in table 6, the Mann-Whitney U Test yielded a Mann-Whitney U value of 0.000, a Z value of -6.012, and an Asymp. Sig. (2-tailed) of 0.000. Since the significance value was lower than 0.05 ($0.000 < 0.05$), a statistically significant difference was found between the experimental and control groups. These findings indicate that the intervention implemented in the experimental group produced significantly better outcomes than the conventional instruction received by the control group. Therefore, the AI-assisted writing intervention was demonstrated to be effective in improving the academic writing performance of vocational students.

D. Qualitative Analysis Results

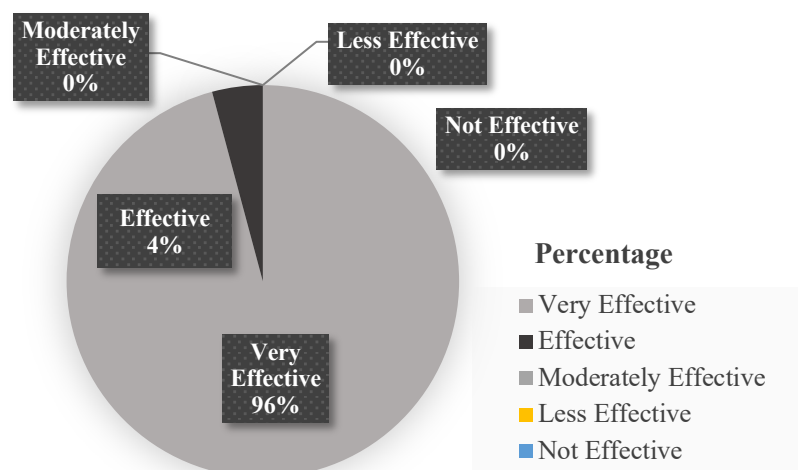


Fig 4. Percentage Results of Respondent Interviews

Based on figure 4, interviews conducted with 24 respondents, the evaluation percentages ranged from 78.75% to 92.50%. Of the participants, 23 respondents (96%) rated the use of AI as highly effective, while 1 respondent (4%) rated it as effective and no respondents selected the other response categories. The overall average interview score was 87.19%, indicating that the use of Artificial Intelligence (AI) as a writing assistant was highly effective in helping students generate research ideas, develop writing outlines, improve grammatical accuracy, enrich academic vocabulary, enhance the quality of academic writing, and accelerate the completion of scholarly work. These findings demonstrate that AI provides substantial support in improving the academic writing skills of vocational students.

AI functions as digital scaffolding, a technology-enhanced instructional support mechanism that helps reduce students' cognitive load, provides immediate feedback, and facilitates a gradual learning process until students become more independent learners [16]. Consequently, AI serves not only as a writing assistance tool but also as a pedagogical support system that enhances the overall quality of the academic writing process. Nevertheless, AI-generated outputs should be critically reviewed, verified, and edited to ensure the validity, originality, and academic integrity of scholarly work. Therefore, AI should function as a learning companion rather than a substitute for students' critical thinking and independent writing abilities.

E. Discussions

The findings of this study demonstrate that the use of Artificial Intelligence (AI) as a writing assistant has a positive effect on improving the academic writing skills of vocational students. This is evidenced by the increase in the experimental group's mean score from 66.20 on the pretest to 85.95 on the posttest, representing an average gain of 19.75 points. These quantitative findings are further supported by the interview results from 24 respondents, in which 23 respondents (96%) rated the use of AI as highly effective, while 1 respondent (4%) rated it as effective, and the remaining response categories had no responses, resulting in an overall average rating of 87.19%. The participants reported that AI helped them generate research ideas, develop writing outlines, improve grammatical accuracy, select more appropriate academic vocabulary, and receive immediate feedback, making the writing process more systematic, efficient, and confidence-enhancing. The consistency between the significant improvement in posttest scores and the students' positive perceptions suggests that AI not only enhances learning outcomes but also provides a more effective learning experience.

These findings highlight the importance of scaffolding in enabling students to achieve higher levels of competence. In this study, AI functioned as a digital learning companion by providing guidance and timely feedback throughout the writing process. AI-based technologies can enhance the quality of learning when used as supportive instructional tools rather than as substitutes for students' cognitive and critical thinking processes. Previous research has likewise shown that the integration of generative AI can improve the quality of academic writing, increase the efficiency of the revision process, and strengthen students' learning motivation [17]. Therefore, the findings of this study provide further empirical evidence that AI is a valuable instructional tool for supporting academic writing in vocational higher education, provided that its use is guided by the principles of academic integrity, critical thinking, and the originality of scholarly work.

VI. Conclusions and Recommendations

A. Conclusions

Based on the findings of this study, it can be concluded that the use of Artificial Intelligence (AI) as a writing assistant is effective in improving the academic writing skills of vocational students. This is evidenced by the increase in the students' mean score from 66.20 on the pretest to 85.95 on the posttest, representing an average improvement of 19.75 points. These findings indicate that the integration of AI has a positive impact on students' ability to produce high-quality academic writing.

The quantitative findings are further supported by the interview results involving 24 respondents, which revealed that 96% of the participants rated the use of AI as highly effective, while 4% considered it effective, resulting in an overall average rating of 87.19%. The students reported that AI helped them generate ideas, organize writing outlines, improve grammatical accuracy, enrich their academic vocabulary, and receive timely feedback, making the writing process more systematic, efficient, and confidence-enhancing.

Overall, the findings demonstrate that Artificial Intelligence (AI) can serve as an effective instructional support tool for academic writing in vocational higher education. However, its implementation should be guided by responsible and ethical practices, ensuring that AI functions as a learning aid that supports students' critical thinking, creativity, and originality while upholding the principles of academic integrity.

B. Recommendations

Students are encouraged to use Artificial Intelligence (AI) responsibly as a supportive tool for academic writing while maintaining critical thinking, the originality of their work, and adherence to academic ethics. Lecturers and higher education institutions are encouraged to integrate AI into academic writing instruction through appropriate pedagogical guidance and the development of clear policies and ethical guidelines for its responsible use. Future researchers are recommended to conduct studies with larger and more diverse samples involving multiple study programs or higher education institutions and to investigate the impact of AI on other educational outcomes, such as critical thinking, creativity, and academic integrity.

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References

- [1] J. Wang, Y. Li, and X. Chen, "The effect of ChatGPT on students' learning performance, perceptions, and higher-order thinking: A meta-analysis," *Humanities and Social Sciences Communications*, 12(87), 1–15. 2025. <https://doi.org/10.1057/s41599-025-04787-y>
- [2] J. B. Alvizo, "The impact of ChatGPT on students' academic writing performance: A meta-analytic study," *Journal of Educational Analytics*, 4(4), 211-229. 2025. <https://doi.org/10.55927/jeda.v4i4.381>
- [3] M. Ekowijayanto, and A.N. Ulvia, "Impact of ChatGPT on Students' Learning Strategies and Critical Thinking Development," *Journal of Innovation in Educational and Cultural Research*. 2025. <http://jiecr.org/> DOI: 10.46843/jiecr.v6i4.2400
- [4] N. Fajaryani, "Navigating the Use of AI in Academic Writing: Perceptions and Strategies of EFL Students," *PROCA Journal*. 2025. <https://doi.org/10.22437/proca.v1i3.50591>
- [5] D. Khampusaen, "The Impact of ChatGPT on Academic Writing Skills and Knowledge: EFL Student Case Study," *LEARN Journal*. 2025. <https://so04.tci-thaijo.org/index.php/LEARN/index>
- [6] Juanda, Azis, and ZF. Ramadhan, "Pemetaan Kompetensi Membaca dan Menulis Akademik Mahasiswa dan Artificial Intelligence dalam Praktik Literasi Ilmiah," 2025. <https://doi.org/10.30605/onoma.v11i4.6884>
- [7] Vieriu AM, et al. "The impact of Artificial Intelligence on students' academic outcomes and engagement," *Educ Sci*, 15(3):343. 2025. <https://doi.org/10.3390/educsci15030343>
- [8] C.G. Puteri, B.Y. Cahyono, U. Widiati, and N. Suryati, "Using ChatGPT as a writing assistant: Essay quality development among Indonesian EFL university students," *Indonesian Journal of Applied Linguistics*, 14(2), 332–346. 2024. <https://doi.org/10.17509/ijal.v14i2.258>

- [9] R. Rahmawati, M. Suhardi, B. Kurniati, et al. "Tinjauan Kritis Terhadap Efektivitas AI Dalam Pengembangan Keterampilan Menulis Akademik Mahasiswa," 2025. <https://doi.org/10.51878/educational.v5i2.6290>
- [10] Taufikin, et al. "Enhancing Undergraduate Research Writing Using ChatGPT: Effectiveness, Student Perceptions, and Ethical Implications," 2024. <https://doi.org/10.23887/jeu.v13i1.94305>
- [11] MA. Bhuiyan, "Adoption of ChatGPT for students' learning effectiveness: Opportunities and ethical challenges," *Education and Information Technologies*, 29(6), 7421-7440. 2024. <https://doi.org/10.1016/j.ijme.2025.101255>
- [12] M. Khalifa, "Using Artificial Intelligence in Academic Writing and Research," Elsevier/ScienceDirect. 2024. <https://doi.org/10.1016/j.cmpbup.2024.100145>
- [13] D.R. Cotton, P.A. Cotton, and J.R. Shipway, "Chatting and cheating: Ensuring academic integrity in the era of ChatGPT," *Innov Educ Teach Int.*;60(4):1-12. 2023. <https://doi.org/10.1080/14703297.2023.2190148>
- [14] N. Shofiah, Z.F. Putera, and N. Solichah, "Challenges and opportunities in the use of artificial intelligence in education for academic writing: A scoping review," 2023. https://doi.org/10.2991/978-2-38476-188-3_20
- [15] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif dan R&D*, Bandung: Alfabeta, 2019.
- [16] Abdullah et al. "Bridging Gaps with Technology: A Systematic Review of Digital Scaffolding in ESL Classrooms," 2026. <https://doi.org/10.37134/ejoss.vol12.sp.9.2026>
- [17] N.L.P Dewi, A. Nazira, and Y. Yulia, "Empowering academic writing through artificial intelligence: A systematic review of benefits and challenges," *Journal of Language & Literature Studies*, 5(3), 785–795. 2025. <https://doi.org/10.36312/jolls.v5i3.3024>