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Tech-Transformed Teaching: The Influence of AI Writing Tools and Blended Learning on Rural Education

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Abstract

This study investigates the impact of AI Writing Tools (AIWT) and Blended Learning (BL) on the writing skills of students in rural educational settings and explores the adaptations required by teachers to effectively integrate these technologies. Using a mixed-methods approach, the research assesses how AIWT and BL enhance English writing proficiency among high school students and identifies the infrastructural and pedagogical challenges faced by English teachers. The findings reveal that AIWT and BL significantly improve student engagement and writing quality by providing personalized feedback and fostering more interactive learning environments. The students showed marked improvements in grammar, vocabulary, and overall coherence in their writing. However, the research also highlights challenges such as variable technological proficiency among teachers and infrastructural limitations in rural schools. As for implications, the study emphasizes the necessity for targeted professional development and infrastructure enhancements to fully leverage the benefits of AIWT and BL in rural educational settings. It suggests that effective integration of technology requires not only technological tools but also comprehensive support systems to assist teachers in overcoming adaptation challenges. These findings offer critical insights for policymakers and educational leaders to develop strategies that support the sustainable implementation of educational technologies, thereby optimizing learning outcomes in underserved regions.

Keywords: AI; Writing Tools; Blended Learning; Teaching Writing.

The integration of artificial intelligence (AI) and blended learning (BL) in the educational environment has increasingly gained attention due to its potential to enhance teaching and learning outcomes. The application of AI in education has expanded to various fields, including language learning, cognitive modeling, and adaptive learning systems (Hapsari & Wu, 2022; Park, 2019; Qi et al., 2022; Sumakul et al., 2022; Toncic, 2020). In English teaching writing, AI can provide real-time feedback (Heift, 2021; Park, 2019), differentiated learning (Pedro et al., 2019), and adaptive content for students (Chong et al., 2023; Kelly et al., 2023; Sandu & Gide, 2019), meeting the individual learning needs

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of students more effectively than traditional teaching methods.

In the context of rural education, the digital divide poses a significant challenge, lagging behind rapid developments, particularly in the utilization of artificial intelligence technology (Muchsin et al., 2022; Poedjiastutie et al., 2021). The gap in access to digital learning resources and quality English writing instruction between urban and rural schools has resulted in lower English writing proficiency among students in rural areas (Peterson, 2011; Wischnowski et al., 2004). Teachers in rural areas are expected to use AI and BL to provide effective, contextual, and differentiated English writing instruction, bridging the gap and ensuring access to quality writing education for all students.

Research on the integration of AI in English writing skills has shown many positive impacts (Divekar* et al., 2022; Long et al., 2021; Park, 2019; Toncic, 2020). However, these studies are limited to urban areas, and further research is needed on their positive impact in rural areas. This includes investigating the effectiveness of specific AIs, identifying challenges and barriers in their implementation, and exploring strategies to optimize the integration of technology in writing education in rural environments.

The urgency of this research is to transform education in rural areas. As an illustration, this study can reduce the educational gap between urban and rural areas by teaching rural children to write English well. Secondly, this research proposes new pedagogical methods that blend AI with conventional teaching methods, which can inspire schools in both rural and urban areas. Thirdly, the study aims to enhance the confidence and writing skills of teachers in rural areas, thereby improving student learning outcomes. This research has the potential to influence educational policy by encouraging the integration of technology and creative pedagogy in rural schools and contributing to the literature on writing instruction in remote locations.

Therefore, based on this background, here are two potential research questions as follows.

1. What are the perceptions and experiences of teachers regarding the implementation of AIWT with BL in English teaching writing at high schools in Central Aceh Regency?
2. Does the integration of AIWT with BL in English teaching writing affect the English writing proficiency of high school students in Central Aceh Regency?

AI in Language Learning

Education has been significantly influenced by AI's ability to automate processes, presenting new challenges for teachers and students (Sumakul et al., 2022). Fundamentally, AI has the potential to revolutionize the ways teachers and students engage in the process of learning English as a Foreign Language (EFL). An important factor to consider when integrating AI into EFL classrooms is the students' adoption level of the technology. Strong evidence from research by Chang et al. (2012) and Davis (1989) indicates that user acceptance is a key factor in effective technology integration to enhance performance.

The use of AIWT in teaching English writing in rural areas has the potential to bridge the gap between the English writing abilities of urban and rural students (Peterson, 2011). Tools such as ChatGPT, Quillbot, and Grammarly can be used to develop writing competencies in remote areas, though they may have some limitations (Kamarullah et al., 2024; Marzuki et al., 2023; Yulia & Amirudin, 2020). Computer-assisted assistance and word processing applications can also incorporate the systematic needs of each individual in English teaching writing (Schwartz, 1984). However, according to Burkhard (2022) and Kamarullah et al. (2016), the use of AI writing tools does require special consideration, as students may have different needs and ways of thinking that might require guidance in their use.

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Blended Learning (BL) in Language Learning

BL, a combination of face-to-face teaching with online resources, effectively improves student learning outcomes across various disciplines, including English language skills, learning independence, and motivation. Students at a university in China found this model beneficial and achieved higher post-test scores (Qiu & Sun, 2017). In the context of Indonesia, BL can indeed enhance English language competencies, learning independence, motivation, and ICT literacy (Menggo & Darong, 2022). Further, Liu (2013) supports these findings by reporting increased interaction between students and teachers, as well as among students, reduced communication anxiety, and enhanced academic writing skills at the university level. Additionally, the practicality and convenience of web-based learning in English teaching writing combined with BL show a positive trend (Turmudi, 2020). These studies indicate that BL can be an effective method for enhancing English language learning outcomes.

BL shows potential in enhancing English writing instruction through applications and digital feedback. However, effective implementation requires trained teachers and technology introduction, especially in rural areas. Therefore, further research is needed to address the research problem formulations, particularly in resource-scarce rural areas.

Implementation of AIWT with BL in Rural Areas

This study offers a new paradigm in English language learning in rural areas as a novelty; previously, research on technology integration in learning has focused solely on learners in urban areas. Unlike the four studies in Figure 1, this research focuses on exploring teachers' perspectives, the impact on students' abilities, and the interaction between software and learning situations.

Additionally, this study employs a mixed-methods approach that combines quantitative analysis (regarding students' English writing skills) and qualitative analysis (exploring teachers' perspectives on this issue). This approach will delve into the effectiveness and feasibility of integrating AIWT and BL in English teaching writing in remote areas, thereby contributing insights and relevant literature studies to contexts lacking technological resources.

Method

This study implemented a mixed-method with an exploratory sequential design, initially exploring qualitative data to support the subsequent quantitative testing phase (Creswell & Creswell, 2022). The research design is divided into three phases. In the first phase, which also addresses the first research question, data collection was conducted through in-depth interviews with four purposively selected English teachers (Cohen et al., 2007) based on their experience using AI writing tools in their teaching. These teachers, serving as informants for this study, come from Muhammadiyah High School Takengon, Public High School 1 Takengon, Islamic High School 1 Takengon, and Islamic High School 2 Takengon. Specifically, the focus of the interviews was to explore their perspectives on the challenges and opportunities associated with the use of AIWT and BL in English teaching writing, their strategies to overcome these challenges, and their experiences with AIWT and BL technologies in the classroom. The qualitative data will then be analyzed using thematic analysis techniques (Alowayid, 2020). In the second phase, a focus group discussion (FGD) in the form of a seminar involving local high school teachers was held. The seminar, titled "the Use of AI in Language Learning," was conducted offline followed by the distribution of modules on this topic. Teachers were asked to develop teaching materials and test instruments using AIWT in a BL format. The results of the qualitative data contribute to assisting teachers in the development of teaching materials and test instruments for students.

Finally, to address the second research question, in the third phase, tests were carried out using a pretest-posttest control and experimental group design, a common method in educational experimental research (Cohen et al., 2007). The subjects of this instrument were public high school students at SMA Negeri 1 Takengon in Central Aceh Regency, Aceh Province, Indonesia. This area was chosen due to the need for more targeted educational improvements (Muchsin et al., 2022).

The quantitative data obtained were presented in the form of tables and graphs after statistical processing in SPSS. Meanwhile, the qualitative data were proceeded through thematic analysis technique to interweave both data results.

Result

Results from Teachers' Views

From the four teachers interviewed as shown in Table 1, the researcher identified several key insights regarding their views on AIWT and BL in English teaching writing.

Table 1: Teachers' Data

Initial	Age	Sex	Teaching experiences (years)	Experiences of using AIWT (years)	AIWT used
AB	42	P	18	2	Grammarly
TU	35	L	10	1	
VW	29	P	7	3	
SR	50	L	25	1	

Impact on content

Generating ideas

Teachers observed that AIWT often provides suggestions or prompts that help students start or continue their writing process, thereby enhancing creativity and originality. AIWT can provide examples or ideas that spark thought, helping students develop new ideas that they might not have considered before. VW highlighted how this technology can be a catalyst for increasing student engagement and participation in writing, especially for those who may struggle to express their ideas traditionally.

> "AIWT allows more introverted students to voice their ideas more boldly. This tool provides suggestions that guide them to develop more cohesive and logical paragraphs, which they often struggled with previously." (VW)

SR, on the other hand, expressed concerns about students' dependency on technology which might reduce their ability to think independently, a crucial skill in creative and academic writing. AB shared similar concerns about how AI might affect the independence and originality of the creative process in student writing. While acknowledging the benefits of technological support in writing, AB reflected that excessive reliance on technology could diminish students' analytical and creative abilities, which are important for their academic and professional development.

> "Even though technology can help, I worry our students become too dependent on AI for writing. They often use the first suggestion from AI without critically considering it, which I think impedes the development of their creative and analytical thinking." (SR)

> "I see some students starting to lose confidence in their own writing abilities. They rely on AI for every aspect of their tasks. This isn't just about choosing words; it's about understanding how they formulate their own arguments, something that a machine cannot always teach." (AB)

Then, in the context of BL, the more dynamic interaction between students and teachers, as well as among students in online discussion forums, helps to generate more ideas and perspectives, which contribute to improved content. TU criticized the interaction aspect in BL, particularly how technology can facilitate but also potentially disrupt organic communication in the classroom. TU acknowledged that while online forums enrich classroom discussions with wider engagement, they also noted that these interactions sometimes lack depth and are less reflective compared to face-to-face discussions.

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> "Online forums provide space for everyone to participate, which is fantastic. However, sometimes, discussions tend to be superficial, more posts but less thought. We need to find a balance between quantity and quality." (TU)

These interactions are said to facilitate a broader exchange of ideas and perspectives, which theoretically should enrich the content of student writing by providing them access to diverse viewpoints and resources. However, as reflected by TU, the practical implementation may not always produce the expected quality of discussion. Although online forums increase the number of interactions, the quality of in-depth and reflective discussions, crucial for effective learning, might not be achieved due to the different dynamics of online interactions. This underscores the importance of monitoring and evaluating how technology is used in education to ensure that it truly contributes to the desired learning objectives. The potential negatives of over-reliance on technology in education, particularly concerning creative and analytical writing, can be eroded if students no longer practice thinking and developing ideas independently, as mentioned by TB.

Vocabulary usage

AIWT often comes with vocabulary suggestion features that not only correct mistakes but also suggest synonyms and more appropriate terms, helping students enrich their vocabulary in their writing. AB explored how the use of AIWT in enhancing students' vocabulary has two sides to the coin. While this technology helps and expands vocabulary knowledge, AB worries about the potential reduction in authenticity and excessive dependency on technological suggestions that can hinder the development of a deeper understanding of language by students.

> "Although AIWT helps students correct and enrich their vocabulary, I see students becoming less proactive in learning new words independently. They often rely on suggestions from AI without trying to understand the context or nuances of the word, which can hinder their long-term language comprehension." (AB)

Moreover, this tool also helps students understand the use of words in different contexts, supporting deeper language learning and enhancing their ability to use vocabulary effectively and appropriately in various types of writing. TU commented on the effectiveness of AIWT in providing contexts for different word uses, enriching students' learning experiences by showing practical applications of vocabulary in various situations. However, TU indicated that this might also result in an unbalanced learning experience where students might not develop the ability to critically analyze and choose words based on their own understanding.

> "This tool is amazing in showing students how words can be used in various contexts, which is very helpful in their learning. However, I often wonder, does this teach them to be critical thinkers or just good technology users? I worry that they might not learn to assess the quality of words and select the most effective ones based on their own judgment." (TU)

Impact on structure and organization

Coherence

In this aspect, the students' ability to logically and sequentially arrange ideas in writing so it is easy to follow for readers is indeed enhanced with the help of AIWT. However, the coherence of students' writing aided by the platform also raises concerns that the use of AIWT, namely reducing students' independence and creativity in the writing process, could indirectly negatively impact the coherence of their writing. Some aspects of these concerns include students losing the expression of their ideas, being overly dependent on technology, and neglecting local contextualization.

Expressed by AB, there are concerns that AIWT might dictate too much how students express their ideas, posing a risk of losing the original voice and writing style of the students. If students simply follow AI suggestions without considering the context or meaning they want to convey, this can lead to less personally or emotionally coherent

writing.

> "I am starting to feel that AIWT dictates a bit too much how students write. On one occasion, a student followed AI advice that ultimately changed the meaning they wanted to convey. This is really concerning; we are losing the original voice of the student in the process." (AB)

TU and VW highlight that students might become too dependent on technology for all aspects of writing, including coherence. This could potentially weaken their ability to develop and hone essential writing skills such as critical thinking and making independent decisions about structure and flow.

> "The use of AIWT encourages efficiency, but I worry we are creating a generation of writers who are just 'good enough'. They become lazy to think critically. Recently, some students even admitted they rely solely on AI suggestions without considering the context or needs of their own writing." (TU)

> "I have seen some students become so dependent on technology that they struggle to write without AIWT. It's like they have lost the ability to think independently. For instance, when our platform experienced technical issues, many students were unable to complete their writing tasks, which shows excessive dependency." (VW)

Next, concerning the neglect of contextualization, as noted by SR, AIWT sometimes can overlook important cultural or contextual nuances necessary for coherence and richness in writing. This shows that technology might not always be capable of capturing or supporting the expression of ideas heavily reliant on specific cultural or situational contexts, which could reduce the authenticity and coherence of the narrative.

> "Sometimes, suggestions from AIWT completely ignore cultural or contextual nuances in writing. A student tried to write about local traditions using AIWT, and the tool suggested replacing cultural terms with more common words that did not capture the essence of the story at all." (SR)

Overall, these concerns indicate that while AIWT can provide valuable technical assistance, excessive reliance on this tool could hinder the development of students' abilities to think independently and creatively in composing coherent and meaningful writing. This affirms the importance of balanced and critical use of technology in writing education, where students are taught to use technological aids as a support, not a replacement, for their writing skills.

Paragraph suitability

The teachers acknowledge that the implementation of AIWT and BL affects the students' ability to form paragraphs with a clear main idea and relevant supporting sentences, reflecting a good understanding of effective writing structure significantly. However, although AIWT often provides features that help students identify and correct their paragraph structures, the teachers express concerns that students might become too dependent on AIWT to form and edit their paragraphs. AB and SR, for example, emphasize that AIWT is effective in providing suggestions, but students should still develop the ability to evaluate and correct their writing independently without overly relying on technology.

> "AIWT has been an amazing tool in helping students understand paragraph structure. However, some students start to feel that 'if AI doesn't suggest a change, then my writing is already perfect,' which isn't always the case." (AB)

> "Using AIWT indeed improves paragraph suitability among students. However, it's important to teach them that this technology is just a tool. True writing skill comes from practice, reflection, and of course, a lot of reading." (SR)

In the context of BL, discussions and feedback from teachers and peers also provide students with opportunities to understand and apply principles of effective paragraph writing in real-time. TU acknowledges monitoring this condition.

> "In forum discussions, I see students applying new ideas about paragraph structure they learned from interactions with classmates and AIWT. This is great to see, but I also remind them that this tool only helps them think about structure, not replace their critical thinking." (TU)

While AIWT helps students understand and apply proper paragraph structure, VW expresses concerns that overuse might lead

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to formulaic writing that lacks creativity. This suggests that education should balance teaching concepts and supporting student creative expression.

Regarding the contradiction between conceptual and student writing creativity, although AIWT helps students understand and apply proper paragraph structure, VW expresses concerns that overuse might lead to formulaic writing that lacks creativity. This suggests that education should balance teaching concepts and supporting student creative expression.

> "I worry we are losing the creativity element in writing. The overly rigid structure sometimes produced by AIWT makes some writing feel formulaic, which is less enjoyable to read." (VW)

Overall, the concerns expressed by the teachers indicate that the use of technology in education should be done wisely, ensuring that students not only learn to comply with rules but also develop critical thinking and deep analytical skills. This enables them to become effective and creative writers, not only in academic contexts but also in their professional and personal lives.

Impact on grammar and word choice

Grammatical appropriateness

In this aspect, the teachers agree that the students' ability to use correct grammar in writing, including the use of verb tenses, subjects, and predicates, as well as correct sentence structure, has a positive impact on them. However, like before, all teachers express concerns about students' dependence on AIWT to correct grammatical mistakes. They note that although this technology is effective in identifying and correcting errors, it can hinder the development of students' understanding of basic grammar. This is because students tend to accept corrections without understanding the reasons behind the changes, which could potentially reduce their independent grammatical skills, as expressed by AB and TU.

> "Even though AIWT helps students use correct grammar, I worry it makes them lazy in learning language rules deeply. For example, when AI corrects the subject and predicate error in the sentence 'He go to school every day' to 'He goes to school every day,' students tend to just accept the correction without understanding the reason." (AB)

> "I find that while AIWT improves students' grammatical ability, some of them become too dependent on technology. There's a tendency to neglect learning basic grammar rules. Recently, one of my students wrote 'She have eaten' and relied on AI to correct it to 'She has eaten' without trying to understand the appropriate subject-verb agreement." (TU)

Then, expressed by VW, there are concerns that AIWT, while ensuring grammatical correctness, often sidelines the use of local or creative expressions in writing. This could dampen the uniqueness of expression in writing that might be more engaging or culturally relevant, replacing it with clearer and more acceptable forms.

> "AIWT is very helpful, yet the authenticity of student expressions sometimes gets lost. For example, the tool often changes rich and colorful local expressions into something more standard and less engaging. Sentences like 'Yesterday, he run all the way home because it starts to rain' are corrected to 'Yesterday, he ran all the way home because it started to rain,' which is correct but loses some local nuances." (VW)

From TU's observations, it appears that there is a need to teach students how to evaluate their own work. This is not only important for developing independent writing skills but also critical in shaping broader analytical thinking.

Lexical richness

Based on interview results, there are two main aspects obtained: the contradiction between students' understanding and the use of vocabulary, and the development of independent vocabulary proficiency. The teachers acknowledge that AIWT helps students use more varied and sophisticated vocabulary, yet there are concerns that students might not fully understand the new words they use. This indicates a risk where students are able to insert impressive-sounding words into their writing without adequate understanding

of their use, which can result in inappropriate or even confusing word usage, as conveyed by AB and TU.

> "The use of AIWT indeed helps students find and use more varied vocabulary. For example, a student replaced 'big' with the more descriptive 'colossal' in their writing. However, I think this condition makes them rely on suggestions from AI and less motivated to learn and remember new vocabulary independently." (AB)

> "I see students using words they normally wouldn't use, thanks to AIWT. For example, in an essay, AI suggested a student replace 'run' with 'gallop,' which is more specific in the context of the story they were writing. However, sometimes students use sophisticated words without a proper understanding of the nuances or connotations of those words, which could cause confusion or inappropriate usage." (TU)

Furthermore, although AIWT provides richer vocabulary alternatives, there are concerns about the long-term impact on students' ability to develop their own vocabulary proficiency. Teaching should not only focus on giving students access to new words but also ensure that students understand how to integrate those words into the correct context and use them effectively. This requires a deeper understanding of the language, which should be instilled through a more holistic teaching approach, not just through technological suggestions.

> "There are moments when AIWT truly enriches student writing with the right vocabulary. For example, in a weather description, a student changed 'very cold' to 'frigid,' which is stronger and more accurate. But, I also see students relying on AI for every word choice, which lowers their ability to think critically about the most effective words to use." (VW)

> "I appreciate how AIWT helps students develop lexical richness. In an assignment, AI helped a student replace 'happy' with 'ecstatic,' which provided a higher level of emotion in their narrative. However, I still teach students that understanding context and meaning is more important than just choosing words based on their sophistication." (SR)

These quotes indicate that while AIWT and BL can provide benefits in enriching students' vocabulary and helping them use more appropriate and varied words, there are serious concerns about the possibility of students becoming overly dependent on technology. This could reduce their ability to develop a deep understanding of language and independent vocabulary skills, which are important for effective communication and authentic self-expression.

Results from Students' Test

Table 2 presents the scores from the pretest and post-test for the experimental and control groups.

Table 2. Overview of Score Improvements for Experimental and Control Groups

No.	Experimental Group Scores		No.	Control Group Scores	
	Pretest	Post-Test		Pretest	Post-Test
1	76	86	1	74	83
2	57	78	2	65	76
3	78	85	3	78	80
4	76	87	4	76	82
5	75	85	5	65	78
6	78	88	6	75	80
7	76	89	7	73	82
8	70	84	8	65	80
9	60	79	9	65	78
10	69	89	10	65	79
11	76	87	11	68	80
12	60	79	12	63	75
13	69	87	13	65	80
14	68	87	14	60	78
15	77	88	15	60	80
16	76	86	16	74	79
17	69	85	17	67	80
18	68	87	18	68	84
19	74	89	19	75	80
20	74	87	20	73	84
21	71	85	21	72	80
22	70	86	22	68	79
23	75	87	23	76	85
24	74	85	24	70	80
25	70	87	25	75	84

According to the data in Table 2, the

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experimental group's lowest pretest score was 57, and the highest was 78. The post-test scores ranged from 78 to 89 for this group. For the control group, the lowest pretest score recorded was 65, with the highest at 78. Additionally, the post-test scores for the control group ranged from 75 to 85.

From this data, it is clear that the pre-test scores of students in both groups were relatively similar. Nonetheless, there was a noticeable shift in the students' English writing scores after the experimental group implemented the use of AIWT within a BL context, evidenced by differing post-test scores between the two groups. Table 3 provides a summary of these pretest and post-test scores.

Table 3. Research Score Summary

Group	Mean	Q1	Median	Q3	Max	Mean	SD
Pretest exp	57	69	74	76	78	71.44	5.72
Post-test exp	78	85	87	87	89	85.68	2.97
Pretest con	60	65	68	74	78	69.40	5.31
Post-test con	75	79	80	82	85	80.24	2.45

Table 3 indicates that the average post-test scores exceeded the pre-test averages for both groups. This increase was subjected to statistical analysis to confirm if the improvement was significant or incidental. The authors employed the Shapiro-Wilk test to assess data normality, with results displayed in Table 4.

Table 4. Normality Test

Group	Test	Statistic	p-value	Remarks	Results
Exp	Pretest	0.864	0.00332	Not normal	Wilcoxon test
	Post-test	0.797	0.000204	Not normal	
Con	Pre-test	0.931	0.0893	Normal	T test
	Post-test	0.929	0.0818	Normal	

The control group underwent a paired sample t-test for normality, while the score enhancements in the experimental group were measured using a non-parametric Wilcoxon test, as detailed in Table 5.

Table 5. Results of Significance Tests

Group	Test	Mean	Df	Statistic	p-value
Exp	Pretest	71.44	14.24	0.000	0.000
	Post-test	85.68			
Con	Pre-test	69.40	10.84	-12.526	0.000
	Post-test	80.24			

According to Table 5, there were significant increases in scores for both groups. Specifically, the experimental group started with a pretest mean score of 71.44 and reached 85.68 post-test. In comparison, the control group began with a mean of 69.40 and increased to 80.24 post-test. These results suggest that the enhancements in scores, as outlined in Table 5, are statistically significant. There are noteworthy differences in both pretest to post-test scores and between the groups themselves. This escalation is graphically represented in Figure 1.

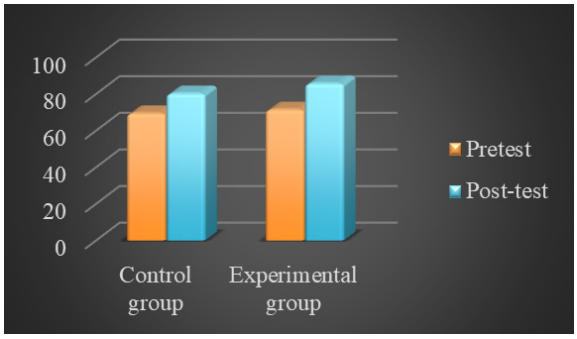

Figure 1. Variations in Pretest and Post-Test Scores among Control and Experimental Groups

Table 6 provides a breakdown of the score improvements, highlighting that the experimental group's mean score increase (14.24) surpasses that of the control group (10.85). This comparison results in a notable score advancement of 3.4.

Table 6. Overview of Score Improvements for Experimental and Control Groups

Group	Min	Q1	Median	Q3	Max	Mean	SD
Exp	7	11	14	18	21	14.24	3.94
Con	2	9	11	13	20	10.84	4.33

An independent sample t-test was employed to examine any score differences between the groups, given that the data on score improvements conformed to normality assumptions, as shown in Table 7. This test was utilized to compare the mean scores of both independent groups to determine if there were significant discrepancies between their average scores. This indicates that the independent sample t-test serves as an effective statistical tool for analyzing significant score differences between groups.

Table 7. Normality Testing for Improvement Data in Experimental and Control Groups

Group	Statistic	p-value	Remarks
Exp	0.937	0.125	Normal
Con	0.985	0.963	Normal

The normality testing results in Table 7 recorded p-values of 0.125 and 0.963 for the experimental and control groups, respectively. If a p-value exceeds the standard significance threshold (commonly 0.05), the data is deemed to have a normal distribution. Results from the independent sample t-test are detailed in Table 8.

Table 8. Significance of Test Outcomes

Group	Mean	Df	Statistic	p-value
Exp	14.24	3.4	-2.905	0.000
Control	10.84			

Table 8 reveals a marked difference in the score improvements between the experimental and control groups, with the experimental group showing a more substantial mean score increase (14.24) compared to the control group's mean (10.84). These data underscores that the experimental group members benefited significantly from the research intervention, leading to notable enhancements in their mean scores, highlighting the positive effects of the experimental classroom intervention.

Discussion

Enhancement of Learning Outcomes

The introduction of AIWT and BL has marked a significant stride in enhancing learning outcomes, particularly in rural educational settings. This study leverages advanced digital tools like Grammarly and ChatGPT, which provide personalized feedback that tailors learning experiences to individual student needs (Burkhard, 2022). Similar to Alowayid (2020), who discusses the profound impact of targeted tutoring on writing skills, this research underscores the role of AIWT in elevating students' language proficiency, setting a foundational context for exploring these technological impacts further.

Personalized feedback through AIWT has revolutionized educational engagement by offering immediate, customized guidance that addresses each student's unique challenges, a capability central to the effectiveness of modern educational tools (Divekar* et al., 2022). Burkhard (2022) emphasizes that such tailored interactions not only enhance learning efficiency but also significantly boost the writing competencies of students. This aligns with findings from this study, where students exhibited marked improvements in their writing assignments, underscoring the critical role of personalized feedback in fostering a dynamic and responsive learning environment.

Furthermore, enhanced engagement and motivation among students were evident in this study, mirroring the benefits highlighted by Menggo and Darong (2022) in their exploration of blended learning effectiveness. The interactive nature of BL, combined with AI tools, as discussed by Chong et al. (2023), significantly bolsters students' confidence and participation, key factors in sustained educational interest. These findings resonate with the observed increase in active participation and enthusiasm among students, indicating that the integrative use of AIWT and BL can transform traditional learning paradigms.

Moreover, regarding the skill development, the use of AIWT has been

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instrumental in advancing students' writing skills, particularly through improved grammatical accuracy and enriched vocabulary. Liu (2013) and Divekar* et al. (2022) both note similar advancements in EFL writing courses, where technology-assisted learning platforms significantly contribute to language skill enhancement. This study confirms these findings, as students demonstrated a better grasp of complex grammatical structures and a broader range of vocabulary, highlighting the efficacy of AIWT in promoting comprehensive language development.

The positive outcomes noted in this study align with broader academic findings, such as those by Chong et al. (2023), who highlight the convenience and effectiveness of mobile technologies in educational settings. However, it also addresses potential over-reliance on technology, a concern echoed by Kamarullah et al. (2024), who caution against the uncritical acceptance of AI in educational contexts. This discussion supports a balanced view that while technology can significantly enhance educational outcomes, it is imperative to integrate it thoughtfully alongside traditional instructional strategies.

Adopting AIWT and BL in rural settings is influenced by various contextual factors, including technological accessibility and digital literacy. The challenges and mitigations discussed in this study reflect those identified by Poedjiastutie et al. (2021), who investigate socio-cultural obstacles in remote education. Addressing these contextual factors is crucial for the successful integration of technology in rural classrooms, ensuring that all students benefit equitably from digital educational resources.

This study suggests that the thoughtful integration of AIWT and BL could be transformative for rural education systems. As Pedro et al. (2019) advocate, there is significant potential for AI in fostering sustainable educational practices. Policymakers and educators should consider these findings to support the development of frameworks that facilitate the effective use of technology in enhancing learning outcomes across diverse educational landscapes.

The integration of AIWT and BL holds considerable promise for enhancing educational outcomes in rural areas, as evidenced by the improvements in student writing skills observed in this study. These technologies, when used judiciously, offer a robust complement to traditional teaching methods, ensuring a holistic and effective educational experience for all students.

Teacher Adaptation and Challenges

In rural educational settings, the adaptation of teachers to AIWT and BL poses both opportunities and challenges. As the use of technology in classrooms grows, educators must navigate the complexities of integrating new tools into traditional teaching practices. The adaptation of new teaching method is also influenced by teachers' perceptions and attitudes towards technology. Chong et al. (2023) found that teachers' confidence in AI significantly affects their willingness to integrate it into their teaching. In this context, some educators expressed concerns about over-reliance on technology potentially diminishing their role or undermining traditional teaching methods. Addressing these concerns through open discussions and demonstrating the complementary nature of AIWT and BL can help in cultivating a more positive attitude and reducing resistance among teachers.

With the shift towards blended learning environments, managing the dynamics of student-teacher interactions becomes more complex. Liu (2013) emphasizes that BL can alter traditional classroom hierarchies and interaction patterns, requiring teachers to develop new management skills. This study highlights that while some teachers appreciated the increased student engagement facilitated by AIWT, others found it challenging to maintain discipline and ensure productive use of technology, pointing to the need for strategies to manage these new interaction

dynamics effectively.

The findings suggest that professional development should not only focus on technical training but also on pedagogical strategies to integrate technology into teaching effectively. As Kelly et al. (2023) suggest, comprehensive professional development programs that address both technological and pedagogical aspects can empower teachers to use AIWT and BL confidently and creatively.

The adaptation of teachers to AIWT and with BL in rural settings is a multifaceted process fraught with challenges but also rich with opportunities for professional growth and enhanced educational outcomes. Ensuring teachers are well-prepared, supported, and confident in using these tools is crucial for realizing the potential benefits of technology in education. This part of the discussion underscores the importance of addressing both the technical and human elements of integrating new educational technologies.

Conclusion

This study has demonstrated the significant potential of AI Writing Tools (AIWT) and Blended Learning (BL) to enhance the educational outcomes of students in rural areas, specifically in improving English writing skills. The integration of these technologies into rural educational settings has led to notable improvements in student engagement, writing quality, and personalized learning experiences. However, the implementation also presents distinct challenges, particularly in adapting teaching practices and overcoming infrastructural limitations.

One of the primary limitations of this research is its reliance on a relatively small sample of schools, which may not fully represent the diverse range of rural educational environments. Additionally, the study's duration did not allow for the observation of long-term impacts of AIWT and BL on student learning outcomes and teacher adaptation. The scope of technology used was also limited to a few AI tools, which may not capture the full spectrum of available educational technologies that could impact learning and teaching practices.

Future studies should consider a broader geographical scope and a longer timeframe to better understand the long-term implications of AIWT and BL integration in rural education. It is recommended that future research explores the impact of a wider range of AI technologies across different subjects to provide a more comprehensive understanding of how these tools affect various aspects of learning and teaching. Additionally, comparative studies between rural and urban settings could elucidate how contextual factors influence the effectiveness of technology-enhanced learning. Furthermore, qualitative studies involving in-depth interviews and focus groups with students and teachers would enrich the quantitative findings, offering deeper insights into the subjective experiences and challenges of using AIWT and BL in rural classrooms. This would also help in developing targeted interventions to support teachers and students more effectively.

In conclusion, while AIWT and BL hold considerable promise for enhancing education in rural settings, the effective realization of their benefits depends critically on addressing the technological, infrastructural, and professional development challenges. Addressing these issues through thoughtful policy, targeted support, and continued research will be essential for ensuring that all students, regardless of their geographic location, have access to high-quality, technologically-supported education that prepares them for the challenges of the 21st century.

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