



Human vs Machine: A Comparative Effectiveness of A Particular Technique and AI Tools in Improving Writing Skills

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Abstract: The research paper titled "Human vs. Machine: A Comparative Effectiveness of A Particular Technique and Artificial Intelligence Tools in Improving Writing Skills." The study investigates the efficacy of a certain method and artificial intelligence tools in improving students' English writing proficiency. The goal of this research is to provide information that will contribute to the development of writing training programs that are both effective and tailored to individual needs. This will ensure a comprehensive approach to language acquisition in the modern age of technology. The study utilized a combination of quantitative and qualitative methodologies to assess the influence of these tools on students' writing abilities. The results emphasize the significance of customized writing instruction that integrates both technological and pedagogical elements in order to improve students' writing skills.

Abstrak: Penelitian ini berjudul "Manusia vs. Mesin: Efisiensi komparatif dari teknik tertentu dan alat kecerdasan buatan dalam meningkatkan keterampilan menulis". Penelitian menyelidiki perbandingan keefektifan antara metode biasa dan alat kecerdasan buatan tertentu dalam meningkatkan kemampuan menulis Bahasa Inggris siswa. Tujuan dari penelitian ini adalah untuk memberikan informasi yang akan berkontribusi pada pengembangan program pelatihan menulis yang efektif dan disesuaikan dengan kebutuhan individu. Hal ini akan memastikan pendekatan komprehensif terhadap pemerolehan bahasa di era teknologi modern. Penelitian ini menggunakan metodologi kuantitatif dan kualitatif untuk menilai pengaruh alat-alat ini terhadap kemampuan menulis siswa. Hasilnya menekankan pentingnya pengajaran menulis dengan mengintegrasikan unsur teknologi dan pedagogi untuk meningkatkan keterampilan menulis siswa.

Keywords: Human, Machine, Particular Technique AI tools, Writing Skills

INTRODUCTION

The study "Human vs. Machine: A Study on the Comparative Effectiveness of a Specific Technique and AI Tools in Enhancing Students' English Writing Skills" expands upon previous studies regarding the influence of AI writing tools on the calibre of student writing. Prior research has demonstrated that the incorporation of artificial intelligence writing

tools can enhance the calibre of English as a Foreign Language (EFL) student writing, hence improving language acquisition results (Marzuki et al., 2023). Nevertheless, the efficacy of writing tools driven by artificial intelligence is contingent upon the particular conditions and settings. It is imperative to have a deeper comprehension of students' perspectives on these tools and devise pedagogical approaches that are more

tailored to individual student requirements (Burkhard, 2022).

This article presents an investigation that intends to further explore the ongoing discussion on the relative usefulness of a certain writing approach and AI technologies in improving the English writing abilities of students. Following up on what other research, specifically the study by Marzuki et al. (2023), found about how AI writing tools can help English as a Foreign Language (EFL) students improve their writing skills, our study wants to find out more about these effects in specific educational settings.

Although previous research highlights the potential advantages of using AI technologies in writing training, it is important to recognize that the success of these tools is not universally applicable. According to Burkhard (2022), the results depend on different circumstances and environments. Hence, it is crucial to thoroughly examine the intricacies of students' viewpoints on these writing tools powered by artificial intelligence. Gaining insight into students' opinions and preferences will facilitate the creation of educational strategies that are more aligned with individual needs, promoting a more tailored and efficient learning experience (Dwivedi et al., 2023; Grájeda et al., 2023; Malik et al., 2023; Owan et al., 2023).

This study seeks to provide significant insights to the continuing discussion about the role of human-guided procedures and AI technologies in English writing teaching. It will achieve this by merging previous research findings with our examination of students' viewpoints. By conducting a thorough examination of these components, our objective is to offer educators detailed advice on how to effectively utilize the advantages of both human and machine-driven methods to maximize the improvement of students' English writing abilities.

Additionally, the study seeks to examine the continuing controversy around the future of writing, particularly the benefits and limitations of utilising artificial intelligence

rather than human intellect to generate written material. AI-generated content presents benefits such as expedited completion and reduced expenses for particular assignments, although it also prompts concerns about the enduring consequences of substituting humans with machines (Chan & Hu, 2023; Han & Xie, 2023; Inaugural & Statement, 2022). Human writers possess distinctive attributes that are beyond the capabilities of AI to imitate, including the capacity for abstract and metaphorical thinking, the ability to utilise personal experiences, emotions, and memories to create more profound content, and the skill to craft narratives that resonate with human experiences (Woo et al., 2022; Xia & Qi, 2022).

The project also seeks to investigate the influence of a certain methodology and artificial intelligence tools on enhancing students' proficiency in English writing. The study inquiries are as follows: (1) What level of effectiveness does the particular technique show in improving students' English writing proficiency? (2) To what extent do AI tools enhance students' proficiency in English writing? (3) What is the relative efficacy of human feedback and automated feedback in enhancing students' English writing proficiency? The hypotheses are as follows: (1) The specific methodology will have a substantial impact on enhancing students' proficiency in English writing. (2) AI tools will greatly enhance students' proficiency in English writing. (3) The integration of both human feedback and automatic feedback would greatly enhance students' English writing proficiency in comparison to relying solely on either human feedback or automated feedback.

The study's importance rests in its potential to make valuable contributions to the field of language teaching and learning, namely by identifying successful methods to use technology in writing training. The study can provide valuable insights for the creation of more effective and tailored writing education that caters to the requirements of a wide range of learners. By using the

advantages of prior research and rectifying their limitations, the study can offer novel perspectives on the relative efficacy of human and AI-driven writing aids in enhancing students' English writing proficiency.

METHOD

This study uses a methodical and scientific strategies to collect, analyze, and interpret data to address research questions and validate hypotheses. The methodology encompasses the techniques and protocols utilized to ensure the reliability and precision of the study's results. This section will include a detailed description of the participant or sample, research protocols, data gathering methods, and data analysis strategies used in the study.

The study included English students from various semesters at IAIN Takengon, representing a diverse group of learners at different stages of their English language competency growth. The sample included students from semester 1 to semester 7, allowing for a comprehensive assessment of the effectiveness of the particular technique and AI technology across various levels of proficiency.

The data gathering process entailed administering pre- and post-tests to assess the students' English writing proficiency prior to and following the deployment of the specific technique and AI technologies. In addition, qualitative data collection methods such as questionnaires and interviews were employed to obtain subjective perspectives from students regarding the efficacy of the intervention.

The questionnaires comprised three sections, which are:

- 1) Regarding demographics, there are two inquiries: a. In which semester are you now enrolled in the English program? b. What was your level of ability in English writing before your participation in the study?
- 2) Regarding the specific technique and AI tools, there are three questions: a. How effective was the specific

technique in enhancing your English writing proficiency? b. How at ease were you in utilizing AI tools to augment your English writing skills? c. Did you encounter any obstacles or complexities in integrating the specific technique and AI tools into your writing practice?

- 3) Regarding the effectiveness of feedback, there are three inquiries: a. How do you evaluate the efficacy of human input in enhancing your proficiency in English writing? What is your assessment of the efficacy of AI-powered automated feedback in enhancing your ability to write English writing? Do you believe that utilizing both human and automated input is more advantageous than depending only on one of them? What are the reasons for or against?

The gathered data underwent analysis employing both quantitative and qualitative methodologies. The quantitative study employed statistical methods to assess the efficacy of the specific approach and artificial intelligence tools in enhancing students' proficiency in English writing. The qualitative analysis concentrated on thoroughly examining the students' experiences and perceptions by interpreting the data collected from surveys and interviews.

The study aimed to gain a thorough grasp of how specific strategies and AI technologies can improve students' English writing skills by using a combination of different research methodologies. This methodological framework guaranteed the achievement of the research objectives and ensured that the study's findings were strong, trustworthy, and significant to the field of language teaching and learning.

RESULT AND DISCUSSION

Result

Semester 1: During the initial semester, both S1 and S2 began with a pre-test score of 60. Following the learning time, they exhibited progress with post-test scores of 75

and 70, respectively. S3, S4, and S5 have shown improvement, albeit with differing initial conditions and results. The results were shown in the Table.1 below:

Table. 1 The Result of Pre-test and Post-test Semester 1

Semester 1	Pre-Test	Post-Test
S1	60	75
S2	60	70
S3	50	75
S4	50	65
S5	60	80

Semester 3: Transitioning to the third semester, there were discernible alterations in the pre-test and post-test results. S1, for example, underwent a marginal decrease from an initial test score of 50 to a subsequent test score of 70. In contrast, S4 and S5 demonstrated significant enhancement, achieving post-test scores of 85 and 90, respectively. The results were shown in the Table.2 below:

Table. 2 The Result of Pre-test and Post-test Semester 3

Semester 3	Pre-Test	Post-Test
S1	50	70
S2	60	75
S3	60	80
S4	70	85
S5	70	90

Semester 5: During the fifth semester, the pre-test and post-test scores continued to develop. S1, S2, and S3 demonstrated improvement, with S3 attaining an excellent score of 85 on the post-test. S4 and S5 continued to show improvement, with post-test scores of 90. The results were shown in the Table.3 below:

Table. 3 The Result of Pre-test and Post-test Semester 5

Semester 5	Pre-Test	Post-Test
S1	50	80
S2	60	80
S3	70	85
S4	80	90
S5	80	90

Semester 7: During the seventh semester, both S1 and S2 consistently improved and obtained post-test scores of 90. S3 had a minor decline in performance; however, S4 demonstrated an impressive post-test score of 95. S5 demonstrated a

commendable performance, achieving a post-test score of 90. The results were shown in the Table.4 below:

Table. 4 The Result of Pre-test and Post-test Semester 7

Semester 7	Pre-Test	Post-Test
S1	70	90
S2	70	90
S3	60	80
S4	80	95
S5	70	90

Collectively, the data demonstrates fluid patterns in the educational trajectory of these individuals. Certain students demonstrated constant improvement over time, while others had swings in their performance. The discrepancies in pre-test and post-test results across many semesters provide valuable insights on the distinct learning paths of these students in their academic pursuits.

Table. 5 The Result of Survey

Questions	Students' Answer				
	1	2	3	4	5
1. How effective was the specific technique in enhancing your English writing proficiency?			3	12	5
2. How at ease were you in utilizing AI tools to augment your English writing skills?			7	12	1
3. Did you encounter any obstacles or complexities in integrating the specific technique and AI tools into your writing practice?			10	6	4
4. How do you evaluate the efficacy of human input in enhancing your proficiency in English writing?			3	15	2
5. What is your assessment of the efficacy of AI-powered automated feedback in enhancing your ability to write English writing?			2	17	1
6. Do you believe that utilizing both human and automated input is more advantageous than depending only on one of them?			1	15	4

From the table 5. above, the writer can conclude are:

Efficacy of a certain methodology: three students reported a low level of effectiveness, whereas twelve students perceived it as somewhat effective, and five students deemed it highly effective.

Efficiency in Employing Artificial Intelligence Tools: out of the total number of students, 7 reported having a poor degree of proficiency in using AI tools, whereas 12 students found it fairly easy, and just 1 student considered it really easy.

Challenges in the process of integration: ten students in all reported facing challenges when incorporating the particular technique and AI technologies into their writing practice. In contrast, a total of 6 students encountered no challenges, while 4 students had a neutral response.

Effectiveness of Human Input: the effectiveness of human input varied, with 3 students seeing it as poor, 15 students as moderate, and 2 students as highly beneficial in improving their ability in English writing.

The effectiveness of AI-powered automated responses: regarding AI-driven automated feedback, 2 students regarded it as having poor efficacy, 17 students thought it to be moderately successful, and 1 student perceived it as highly helpful in developing their English writing skills.

Advocacy for the Application of Both Inputs: when questioned about the belief in the utilisation of both human and automated input, one student stated a conviction in its benefits, whereas fifteen students held the view that it is not advantageous. In addition, four students gave a neutral reaction.

The result of interview

Q1) Proficiency in Writing Technique:

Consistently favorable feedback was received from participants over all semesters, indicating that they had a positive experience with the writing technique. They specifically emphasized how the technique had a transforming effect on their sentence construction and overall approach to writing.

Q2) Enhancement Contribution:

Universal Enhancement: Participants from different academic fields completely concurred that engaging in the writing technique substantially enhanced their writing abilities. They observed enhancements in the

understanding of grammar and overall proficiency in writing.

Q3) Proficiency with AI Tools:

Participants quickly and effectively adapted to utilizing AI technologies, overcoming any initial reservations, and expressing a positive reception towards the prompt feedback provided. The level of comfort with AI technologies steadily rose across the semesters.

Q4) Limitations of AI Tools:

Initial Obstacles: The integration of AI technologies initially posed obstacles for participants, but these difficulties were regularly resolved as the semesters advanced. AI tools have become invaluable resources for enhancing writing proficiency.

Q5) Contribution of feedback from humans:

Significant Human Insight: The input from humans constantly proved to be quite beneficial, as it offered valuable perspectives on cultural subtleties and enhanced the emotional complexity of the writing. Participants emphasized the significance of this human factor throughout all semesters.

Q6) Advantages and Disadvantages of AI Feedback:

Participants recognized the efficacy of AI feedback in promptly rectifying errors. Nevertheless, they constantly acknowledged the profound value of human feedback, particularly in relation to cultural context and nuanced opinions.

Q7) Effects of Consolidated Feedback:

The integration of artificial intelligence and human feedback has had a widespread effect on overall enhancement. The software swiftly rectified grammatical problems while maintaining the inherent fluidity and cultural subtleties of the work.

Q8) Technology's Impact on Language Learning Perception:

Anticipating a Crucial Role: Throughout all semesters, participants expected AI tools to play a continuous and vital role in language learning. Their vision

involves providing tailored assistance and promoting the cultivation of self-reliant abilities using technology.

The interview results offer useful data into the efficacy of the particular technique and AI tools in improving students' English writing proficiency. The participants repeatedly expressed positive feedback regarding the writing style, highlighting its transformative impact on their sentence structure and general writing approach. The participants unanimously agreed that practicing the writing technique significantly improved their writing skills, demonstrating a universal improvement. The participants adeptly and efficiently embraced the use of AI technology, displaying a favorable response to the immediate feedback given.

Nevertheless, the incorporation of AI technology originally presented challenges for the participants, which were consistently overcome as the semesters progressed. The participants acknowledged the effectiveness of AI feedback in quickly correcting mistakes, but they consistently recognized the significant importance of human feedback, especially when it comes to cultural context and subtle viewpoints. The combination of artificial intelligence and human feedback had a significant impact on improving the overall quality, as the program quickly corrected grammatical errors while preserving the natural flow and cultural nuances of the work.

The participants anticipated that AI tools would have an ongoing and crucial function in language learning, encompassing the provision of personalized support and fostering the development of independent skills through technology. The interview findings are consistent with prior studies that highlight the individualized nature of language learning and the importance of overcoming barriers to integrating technology in the field of education. The results emphasize the need for tailored instructional approaches and evaluation tactics, considering both individual viewpoints and technological aptitude. The interview results offer useful insights into the

ongoing exploration of personalized approaches to enhance students' English writing proficiency.

Research Questions and Related Findings

1. What level of effectiveness does the particular technique show in improving students' English writing proficiency?

- The pre-test and post-test scores from different semesters demonstrate different degrees of improvement, suggesting the efficacy of the specific technique. During Semester 1, all students showed an improvement in their scores, particularly in S1 and S5, where there were notable increases of 15 and 20 points, respectively. By the seventh semester, the majority of students showed significant progress, with S1 and S2 achieving a post-test score of 90.

- Interview Feedback: Participants frequently expressed a favorable experience with the writing process, emphasizing its profound influence on sentence structure and overall writing methodology. They noticed significant improvements in their language comprehension and writing ability.

- Survey Results: Out of the pupils, 12 experienced the technique as moderately effective, 5 found it to be highly effective, and just 3 reported a low level of effectiveness. The data suggests that a significant proportion of pupils acknowledged the advantages of the strategy.

2. To what extent do AI tools enhance students' proficiency in English writing?

Quantitative Findings:

- The gradual enhancements in post-test scores throughout the semesters indicate that AI technologies contributed to the improvement of writing skills. As an illustration, during Semester 3, the scores of S4 and S5

experienced a substantial improvement, reaching 85 and 90, respectively.

- Interview Feedback: Participants rapidly acclimated to artificial intelligence tools, which offered immediate feedback and proved to be great assets for improving writing skills. Participants gradually developed a higher level of comfort with AI technologies as they progressed through the semesters, despite facing initial challenges.
- Survey Results: The majority of students (12) regarded the use of AI tools as rather effortless; however, seven students encountered certain challenges. Merely one student perceived it as really effortless, indicating that although AI technologies are advantageous, there is a need to acquire a certain level of proficiency.

3. What is the relative efficacy of human feedback and automated feedback in enhancing students' English writing proficiency?

Quantitative Findings:

- The increase in post-test scores suggests that both human and AI feedback have a role in enhancing writing proficiency. In Semester 5, S3 attained a post-test score of 85, indicating significant advancement.
- Interview Feedback: AI responses could not entirely replicate the cultural insights and emotional depth provided by human input, which participants appreciated. However, participants highly valued the prompt and accurate error correction that AI feedback provided. The integration of artificial intelligence (AI) with human input proved to be remarkably efficient, as AI tools promptly rectified

grammatical errors while human feedback enhanced the cultural and emotional aspects of writing.

- Survey Results: Out of the total number of students, 15 considered human input to be moderately good, 2 considered it to be highly beneficial, and 3 assessed it as terrible. 17 students deemed the AI feedback moderately successful, 1 student deemed it highly beneficial, and 2 students deemed it terrible. 15 students perceived the amalgamation of both inputs as beneficial, demonstrating a strong preference for an integrated approach.

The study showcases that both the particular methodology and artificial intelligence tools substantially improve students' competency in English writing. The numerical data demonstrate a steady enhancement over the academic terms, corroborated by favorable subjective comments from students. Human feedback is essential for providing nuanced and culturally diverse advice. However, AI feedback enhances this process with its efficiency and immediate response. The combination of the two methods works especially well, showing that the best way to improve writing skills is to use a comprehensive approach that includes both human and AI contributions.

Discussion

Effectiveness of the Specific Technique:

The varying opinions on the efficacy of the specific technique are consistent with the study inquiry (1) regarding the degree of effectiveness of the methodology. Three students regarded it as ineffective, whereas twelve students deemed it moderately effective, and five students deemed it highly effective. The discrepancies in reactions underscore the significance of individual disparities in learning inclinations and backgrounds (Afzal, 2019; Basar et al., 2021; Poulou et al., 2019).

AI Tools' Impact on Writing Proficiency:

The results pertaining to the effectiveness of AI tools in enhancing writing skills corroborate study question (2). Seven students have indicated a low degree of skill, suggesting difficulties in effectively applying artificial intelligence systems. Nonetheless, twelve students found it quite effortless, and one deemed it really effortless, indicating a substantial percentage of students successfully acclimating to AI technologies.

Obstacles in the process of integration:

Research question (3) investigated the difficulties associated with using the approach and AI technologies into writing activities. Ten students had difficulties, six experienced no issues, and four had a neutral reaction. The diverse encounters underscore the significance of tackling obstacles to guarantee a seamless integration procedure (Hutson, 2023; Lukyanenko et al., 2022; Ozmen Garibay et al., 2023).

Efficacy of Human and Automated Feedback:

The varied opinions regarding the efficacy of human input and AI-driven automated responses are consistent with research inquiries (3). The perception of human input varied among the students, with three considering it to be inadequate, fifteen regarding it as average, and two recognizing it as really advantageous. In relation to automated feedback, two students perceived it as inadequate, seventeen as fairly effective, and one as really beneficial. These findings underscore the necessity of tailoring feedback to individual preferences, highlighting the importance of a tailored approach (Chan & Hu, 2023; Kamalov et al., 2023).

Scientific Analysis and Hypothesis Testing:

1. Evaluation of the Methodology's Efficacy:

The diverse reactions concerning the efficacy of the specific method suggest that its influence is subjective. While several students found it exceedingly efficient, others reported diminished

levels. This implies that the particular practice may not have a uniformly significant effect, which reinforces the importance of individualized approaches in language learning (Zimmerman, 2010).

2. The Impact of AI Tools on Writing Proficiency:

The varying levels of competency in utilizing AI tools suggest that although a considerable majority of students found them very straightforward, some participants still face difficulties. This implies that the premise (2) asserting that AI tools will significantly improve efficiency may not be uniformly valid, underscoring the significance of addressing individual learning requirements.

3. Challenges in Integration:

The varying viewpoints regarding the promotion of including both human and machine input pose a challenge to hypothesis (3). Although one student held a belief in the advantages of it, fifteen students did not perceive it as advantageous. This implies that a universal method may not be appropriate, and the efficacy of integrating both inputs may rely on individual preferences.

4. Effectiveness of Human and Automated Feedback:

The findings align with prior research that emphasizes the personalized aspect of language acquisition. Research focusing on individualized strategies for enhancing writing skills and the impact of technology in education corroborate the notion that the effectiveness of these methods differs among students (Cole & Feng, 2015; Little et al., 2018; Marleni, 2020; Sandolo, 2010).

The difficulties encountered by certain students in incorporating the methodology and AI tools correspond to the literature's emphasis on the significance of overcoming obstacles to the use of technology in education (Sandolo, 2010).

The differing evaluations of the efficacy of human and automated input align with research that emphasizes the importance of a well-rounded strategy, taking into account both human perspectives and technology proficiency (Kern et al., 2022; Korteling et al., 2021; Pflanzner et al., 2023).

The research results highlight the personalized aspect of language acquisition, underlining the necessity for customized teaching methods and feedback strategies. Although the particular methodology and artificial intelligence tools display potential, it is essential to tackle obstacles and take into account a wide range of preferences in order to achieve successful integration. The findings question certain hypotheses, emphasizing the significance of adaptability in educational tactics and the ongoing investigation of individualized methods to improve students' English writing skills.

Implication and Limitation

The study's findings have substantial ramifications for the creation of efficient and tailored writing training programs. The findings emphasize the importance of personalized approaches in language acquisition, as well as the need for customized teaching techniques and feedback mechanisms. The study's limitations include the possibility of bias in self-reported data and the limited applicability of the findings to other populations. Subsequent studies should focus on overcoming these constraints and investigating the enduring impacts of the particular methodology and artificial intelligence technologies on students' English writing skills.

Addressing Limitations

Future research should incorporate more objective indicators of writing proficiency and increase the sample size to encompass a wider spectrum of learners, in order to overcome the constraints of the study. Furthermore, it is imperative to reproduce the study's findings in various educational settings in order to ascertain the generalizability of the results. A future study can overcome these constraints to gain a

more comprehensive grasp of how the specific technique and AI tools effectively improve students' English writing skills.

CONCLUSION

The research, titled "Human vs. Machine: A Study on the Comparative Effectiveness of a Specific Technique and AI Tools in Enhancing Students' English Writing Skills," examined how a specific approach and artificial intelligence tools influenced the English writing proficiency of students. The study investigated three primary inquiries and hypotheses, providing significant contributions to the domain of language instruction and acquisition.

1) Research Discoveries and Contributions to the Field of Science: Efficacy of the Specific Method

The investigation unveiled a range of perspectives regarding the efficacy of the particular method. Three students expressed dissatisfaction with its effectiveness, whereas twelve students considered it somewhat effective, and five students regarded it as highly effective. This sophisticated comprehension emphasizes the significance of tailored methods in writing instruction.

2) Optimizing the Utilization of AI Tools:

The students' proficiency in utilizing AI technologies exhibited a range of abilities, with 7 students expressing low proficiency, 12 students finding it somewhat effortless, and 1 student considering it quite effortless. This underscores the importance of taking into account students' technological preparedness when integrating AI-powered tools into writing instruction.

3) Obstacles in the process of integration:

Ten students had difficulties incorporating the particular technique and AI technology into their writing practice, in contrast to six students who faced no difficulties and four who had a neutral reaction. Tackling these

obstacles is essential for effective execution.

- 4) **Efficacy of Human Input:**
The feedback from humans was assessed with varying opinions, as 3 students considered it to be inadequate, 15 students found it to be average, and 2 students regarded it as highly advantageous. This underscores the significance of taking into account the varied effects of human influence on students' writing skills.
- 5) **Efficacy of AI-driven automated responses:**
Seventeen students found AI-driven automated feedback to be moderately successful, while two students found it to be awful, and one student found it to be incredibly beneficial. Ensuring a careful equilibrium between the advantages and constraints of AI-generated feedback is essential for successful implementation.
- 6) **Advocacy for Both Perspectives:**

Opinions about the use of both human and automated input were polarized, with one student expressing a strong belief in its advantages, fifteen students having the opinion that it is not beneficial, and four students remaining neutral. This indicates a requirement for adaptable strategies that accommodate individual preferences.

The study's significance comes in its detailed examination of the efficacy of the particular methodology and artificial intelligence technologies, taking into account variations across students.

The results underscore the significance of customized writing instruction, taking into account both technological and pedagogical factors.

Suggestions for future research encompass delving into more individualized techniques, tackling technological obstacles, and examining the enduring effects of AI-powered writing tools.

Applications and Developments: The research offers valuable information for educators in creating writing interventions

that take into account individual preferences and technology preparedness.

The findings have ramifications for the continuing discussion over the role of AI in writing, advocating for a balanced approach that values both human creativity and the efficiency of technology.

Ultimately, this study enhances our understanding of the intricate relationship among a certain writing approach, artificial intelligence tools, and students' writing proficiency, making a valuable contribution to the field of science. It serves as a framework for additional studies, fostering a more thorough understanding of the interface between technology and language instruction.

The knowledge acquired from this research has the capacity to guide the creation of efficient and tailored writing training programs, guaranteeing a comprehensive approach to language acquisition in the digital age.

Recommendations

The study's findings have substantial ramifications for the creation of efficient and tailored writing training programs. To facilitate the seamless integration of AI tools with human guidance, educators should:

1. **Customize Writing Instruction:** Provide individualized assistance and cultivate self-reliance skills through technology.

1. **Overcome technology barriers:** ensure that students have the necessary technological readiness to efficiently apply AI tools.
2. **Equilibrium Human and Automated Feedback:** Strive to strike a delicate balance between the benefits and limitations of AI-generated feedback.
3. **Adaptive techniques** can be developed to accommodate individual preferences and opinions on the use of both human and automated input.
4. **Implement an ongoing monitoring and evaluation process** to regularly gauge the efficacy of AI tools and human guidance in order to ensure

their alignment with students' needs and preferences.

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