

USING VIRTUAL WRITING TUTOR IN TEACHING WRITING TO EFL LEARNERS

T. Thyrhaya Zein¹ , T. Silvana Sinar^{1,*} , Deliana Deliana¹ ¹ Universitas Sumatera Utara, Sumatera Utara, IndonesiaCorresponding author email: tengkusilvana@usu.ac.id

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Abstract

The rapid advancement of technology has reshaped various sectors of human life, including education, where digital tools are increasingly integrated into instructional practices. Among these tools, the Virtual Writing Tutor (VWT) has emerged as a promising platform for enhancing writing instruction through real-time feedback and automated assessment. While existing studies have explored VWT's potential in assisting writing tasks, limited research has examined its integration into a structured, pedagogically sound writing learning model. This study aims to evaluate the effectiveness of incorporating VWT within a comprehensive writing instruction model and its impact on improving students' academic writing skills. Employing a descriptive research design, this study involved 30 undergraduate students from the English Literature Study Program at Universitas Sumatera Utara. Writing tests were administered before and after the implementation of the VWT-integrated model. Students' written outputs were assessed using VWT's diagnostic features, focusing on coherence, grammar accuracy, vocabulary use, punctuation, and spelling. The data were analyzed descriptively to capture improvement patterns and student performance trends. The findings demonstrate that VWT significantly supports students in the writing process by helping them generate, structure, and refine their ideas with more autonomy. Students also showed improved awareness of language mechanics and vocabulary selection. A novel contribution of this study is its proposal of a VWT-integrated instructional framework that not only facilitates independent learning but also complements teacher feedback. These findings underscore the importance of embedding technological tools like VWT into writing pedagogy to enhance writing outcomes and promote learner-centered instruction in higher education.

Keywords: Technology In Teaching, Teaching Writing, Virtual Writing Tutor, Writing Ability



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INTRODUCTION

In recent years, the integration of technology into education has revolutionized the learning experience. The efficacy and efficiency of the learning process can be raised by utilizing digital platforms and electronic resources (Mashau & Nyawo, 2021; Mawardani et al., 2023; Hyskaj et al., 2024). Students need to be taught 21st century skills in addition to traditional academic knowledge,

such as problem solving, teamwork, interpersonal communication, digital literacy, and critical thinking (Partnership for 21st Century Skills, 2007). As a result, we require an instructional approach that promotes student engagement and cooperative group projects, both of which are critical for the growth of creativity and problem-solving skills (Prince, 2004; Sriyati et al., 2019; Fitriani, F., Triandafilidis, T., & Thao, 2023; Binti M, & Adeshina, 2024). Responding to the 21st century skills needed in teaching, previous studies have been extensively conducted on the involvement of technology in teaching, such as using web-based platforms (Al Badi et al., 2020; Nasution et al., 2023; Nguyen et al., 2023; Perdana et al., 2023; Sinar et al., 2023), educational software (Kazanci & Okan, 2009; Mukundan & Nimehchisalem, 2011; Şahin & Özenç, 2021), technological tools of Web 2.0 or 3.0 (Alamri, 2021), and online tools (Khuong, 2022; Tedjo, 2022).

One such innovative technology is the Virtual Writing Tutor (VWT) (Al Badi et al., 2020; Nasution et al., 2023; Perdana et al., 2023), a web-based platform designed to help students improve their writing skills. This article explores the implementation of VWT through the case method learning approach, aiming to enhance students' writing abilities and qualify their writing effectively. The case method learning approach is widely recognized for its effectiveness in developing critical thinking and problem-solving skills. By presenting students with real-world situations, case studies engage students in active learning and encourage them to analyze, discuss, and propose solutions. Integrating VWT into case method learning can provide students with immediate feedback and personalized suggestions to enhance their writing skills.

Based on the case study approach and project-based learning, there are two learning models that can raise the caliber of writing produced by students. The Case Study Method is a case study approach that entails a thorough examination of actual circumstances or challenging issues. A project-based learning is teaching students through assignments or projects that need them to solve problems and produce a final product that might be either a written report or a presentation. By using a project-based learning, the students will (1) conduct independent research to delve deeper into the subject; (2) arrange and plan their writing to provide project outcomes; and (3) clearly and methodically convey findings, analysis, and conclusions in written reports (Thomas et al., 1999).

When learning to write, integrating the Case Method with Project-Based Learning can have complementing effects. Students can practice in-depth analysis and reasoning in the setting of actual cases by using the Case Method. Project-Based Learning, on the other hand, allows the students to improve their writing abilities through useful applications in the actual projects.

Based on the results of the observations conducted in the English Literature Study Program of Universitas Sumatera Utara, the students encountered various problems in writing; e.g., expressing clear ideas, presenting logical arguments, writing grammatically accepted sentences, using correct diction and punctuations, and using references to support their claims. In addition, the results of the observations also reveal the lecturers' shortcomings in teaching writing: (1) the lecturers' lack of bravery in implementing case-based collaborative learning; (2) their diminished capacity for professional development in creating adaptive learning models; and (3) their disregard for feedback and the need to adapt the learning process in a responsive manner in order to preserve learning continuity. Therefore, a learning model that can overcome those problems is obviously needed. The Virtual Writing Tutor (VWT) can be used to create a learning model that helps the students to solve such problems and the lecturers' shortcomings in teaching because it offers automated feedback on grammar, spelling, writing style, and other writing-related topics to assist students in improving the quality of their writing.

The aforementioned description indicates that the purpose of this research is to use VWT integrating the Case Method with Project-Based Learning in teaching writing to EFL learners. The possibility of using VWT in teaching writing is due to a number of reasons, including (1) consistent, organized use of VWT can help students become better writers over time; (2) VWT can give students pertinent, helpful feedback and explain how that feedback impacts their writing development; and (3) VWT affects students' drive to become better writers and develop their self-confidence in writing.

To address the difficulties the students encounter when writing and to raise the standard of instruction overall, research on project-based learning and the case study approach is urgently needed in order to enhance writing quality through Virtual Writing Tutor. This study can demonstrate the advantages and efficacy of this technology in assisting students in developing their writing abilities, which can offer direction for the application of other educational technologies. The Virtual Writing Tutor (VWT), a technology-enabled learning model approach, can help address the issues of 21st-century learning by integrating case-based learning with writing instruction.

Case Method Learning Model

The case method learning model involves analysis and discussion of real cases or situations that are relevant to the learning topic. Students are asked to study the case in depth, analyze the existing problems, and prepare the written arguments or recommendations (Herreid, 2006). The example of real-world cases or circumstances that are pertinent to the learning topic are analyzed and discussed as part of the method learning paradigm. Students are required to do a thorough analysis of the case, formulate written arguments or suggestions, and examine the case in detail. Moreover, in learning writing using a case method, students should identify the problem to be analyzed, decide on the perspective for presenting the problem, and write a feature article based on its genre-forming and genre-defining characteristics (Chen, Li, & Yi, 2020; Priya, 2021; Ukhova et al., 2021). Using a case method learning model in teaching writing enhances student participation (Escartín et al., 2015; Amrani, & Ducq, 2020; Basar et al., 2021).

In addition to a case method learning model, another learning model that encourages students' active participation, leading to their increased engagement, is a project based learning. Using this method, students are more engaged when they are encouraged to participate actively in the class projects. Students who engage in project-based learning are more motivated to learn and develop a deeper understanding of the subject matter (Thomas, 2000; Bui et al., 2020; Sibbald et al., 2021). By working on real-world projects, students can see the relevance of their learning and its application in practical situations. Students get an understanding of the practical applications of their learning and the relevance of what they have learned by working on real-world projects. This connection between theory and practice fosters a sense of ownership of their education, resulting in the student's increased engagement.

In the context of English language learning, writing has three main goals: to persuade, to express or narrate, or to instruct (O'Malley & Pierce, 1996). Informative texts are written with the intention of educating readers, imparting knowledge, and expressing opinions. Expressive or narrative texts are frequently utilized to produce entertaining plays, poetry, stories, and discoveries. Persuasive texts are written with the intention of persuading the reader to act, i.e., to persuade people to make changes. Writing of this kind includes reviews of movies, literature, commercial goods, and contentious subjects. The purpose of argumentation is to persuade and convince. It is frequently encountered in conjunction with exposition and has a tight relationship to it (Gerot & Wignell, 1994). Making a case or proving or disproving a claim or assertion is done through argumentation.

Previous Studies on VWT

A study on the use of Virtual Writing Tutor (VWT) in teaching writing has been carried out by several researchers. Khuong found that most participants felt that using online resources to improve their essay writing skills was a good idea, and that no percentage of respondents indicated that they strongly disagreed with any of the questionnaire items (Harwood, & Koyama, 2020; Hemachandran et al., 2022; Khuong, 2022). Furthermore, this instrument adds interactivity to online English essay writing classes. Five online tools have been adopted by educators to promote more engagement in the classroom. The results of the questionnaire showed that most of the participants supported the implementation of these tools and agreed that they had a positive impact on their essay writing learning. A total of 81.8% of participants strongly agreed with the idea that online tools are effective tools to help students in each writing step, including prewriting, writing, organizing, editing, and rewriting.

The next study was conducted by Tedjo, who found that online group students (a group of students with online instructions) significantly improved their writing skills (Alam, 2022; Tedjo, 2022; Graefen & Fazal, 2024). The students felt that they had made the most improvement in terms of grammar in their writing, indicated by their increased scores in the post-test. In addition, the students' vocabulary and organizational skills had improved. An average score of 32 was obtained for the pre-test and 42.6 for the post-test in the group's assessments. Two months of writing practice and revision with the online feedback tool Proof Writer resulted in an average improvement of 10.6 points on the post-test for the ten subjects from the online group. While the online group students appreciated that criticism was available right away, they also considered Proof Writer to be a straightforward and user-friendly program. Sixty percent of them admitted that they frequently do not comprehend the criticism they receive. Eighty percent of them felt that the criticism was overly generic. When they do not understand the exact problem that the Proof writer's feedback has shown, they just guess, rephrase (write new

sentences and new sentences and proofread them again), or discuss with peers or teachers. Therefore, the students felt that the Proof writer helped them in providing feedback for revising.

Moreover, the other previous study found that the experimental group enjoyed using the VWT software and found it beneficial and helpful in checking the accuracy of their essays including spelling, punctuation, grammar, and vocabulary. They believe that VWT has shifted the conventional art of personal tutoring to a more reliable form of e-feedback that can be provided in both synchronous and asynchronous learning environments (Al Badi et al., 2020; Liew et al., 2023). The results of this study show that VWT not only saves teachers a great deal of time, but it also aids students in acquiring self-use error correcting abilities, which can support ubiquitous and self-regulated learning. Furthermore, the latest research found that the use of VWT in teaching writing improves the students' ability in writing a scientific text in English. The results of their study indicate that the application of ICT (e.g., VWT) in classroom learning is very important and needs to be maximized (Perdana et al., 2023). These previous studies contribute to the body of literature by examining the precise impacts of VWT on the EFL students' academic achievement.

The previous studies mentioned above left the gap that can be filled in by this present study. They only examined the effectiveness of using VWT in improving the students' writing ability, while focusing a little attention on how it was used as a learning model in teaching writing. Besides, the previous studies were not interested in applying VWT using certain teaching methods. This present study aims to evaluate the efficacy of integrating the VWT in a learning model for writing. Besides, this study also used a Case Method Learning and Project-Based Learning in applying VWT in teaching writing to university students.

This study is urgently needed to bridge the existing research gap by evaluating the efficacy of integrating VWT in a structured learning model for writing instruction. By doing so, it will provide valuable insights for educators seeking to enhance their teaching methods and support students in overcoming their writing challenges. Furthermore, the findings will contribute to the broader discourse on technology-assisted learning, demonstrating the potential of VWT to revolutionize writing instruction in higher education. Addressing these issues now is crucial to ensuring that students are equipped with the necessary writing competencies required for academic and professional success in the 21st century.

RESEARCH METHOD

This study was conducted using a descriptive method as it described the phenomenon of the students' writing skill improvement after being taught using a VWT-based learning model. The population consisted of three classes—Class A, Class B, and Class C—of fourth-semester students in the Academic Year 2022-2023 at the English Literature Study Program, Universitas Sumatera Utara. Each class comprised 30 students, bringing the total population to 90 students. From this population, a sample of 30 students was selected using a random sampling technique. This approach was feasible because all participants had comparable levels of English proficiency, ensuring the reliability of the sampling process.

The data were collected using writing tests, where the students were asked to write two argumentative essays. Their essays were evaluated by using the Virtual Writing Tutor. After that, their essays were returned to them. Then, they were introduced to a VWT-based learning model to guide them in writing. Then, they were asked to revise both of their argumentative essays by using the Virtual Writing Tutor (VWT). Their revised essays were scored again by using the Virtual Writing Tutor.

Then, the students' scores were analyzed descriptively by comparing the scores before getting an introduction to a VWT-based learning model and the scores after the revisions. The results were then interpreted to examine the efficacy of integrating the VWT-based learning model in improving the students' writing ability.

RESULTS AND DISCUSSION

As previously mentioned, the main goal of this research project is to create a comprehensive pedagogical framework that combines project-based learning and case-based learning, strengthened by the addition of online writing coaches, in order to accelerate improvements in students' writing skills. Through the integration of these components, the research aims to tackle the ongoing difficulty teachers face in helping students develop proficient writing abilities. As a key element of this novel approach, Virtual Writing Tutor (VWT) provides a promising channel for tailored feedback and direction, which

enhances the learning process. The comparative analysis shows a clear improvement in writing proficiency after the intervention, highlighting the transformative effect of the integrated approach on improving student writing capabilities. These findings demonstrate the effectiveness of the developed pedagogical model as well as the potential of online writing coaches like VWT to enable students to improve their written expression through individualized guidance and helpful criticism. Table 1 provides a concise overview of the summary results that summarize the writing scores of the students, which were carefully recorded before and after they used the Virtual Writing Tutor.

Table 1. Students' score recapitulation

No.	1 st Essay		2 nd Essay	
	Evaluation Score Prior to Revision	Score Following Revision	Evaluation Score Prior to Revision	Score Following Revision
1	38.5	43.5	40	52.5
2	28.75	31.25	37.75	47.5
3	43.25	50	40.75	50
4	41.25	43.5	30.25	43.75
5	54.25	62	33.25	50
6	41.75	69.75	49.75	60.5
7	63.5	70.5	47	65.25
8	49.25	59.5	46.75	66.25
9	56.25	67.25	38.75	50.75
10	45.25	45.25	51.75	60
11	47	65	42	50
12	50.75	53	40.75	60
13	40.25	48.5	55.25	56.5
14	43	51.25	50.75	39
15	37	50.75	35.5	50
16	47.75	47.75	64.25	65
17	42.5	51.25	40	60
18	35.25	47.5	36.25	49.25
19	44	60.25	23.75	52.5
20	37.35	42.75	39.75	44.25
21	58.25	70.75	35.75	41.5
22	52.25	60	44	48.5
23	47.25	49	39.25	42.5
24	49.5	55.75	42.25	43.25
25	42.25	46.5	44	62
26	36.75	45.5	46.5	51.5
27	41.25	64.25	40	60
28	49.25	59.5	46.75	66.25
29	37.35	42.75	39.75	44.25
30	49.25	59.5	46.75	66.25

As seen in Table 1, the two argumentative essays of the students were also evaluated in two different versions in order to provide a thorough assessment of their performance. Each of the students' argumentative essays is composed of the the original version and the revised version. A more nuanced understanding of how students' writing proficiency changed over the course of the intervention process was made possible by this thorough examination. Notably, the outcomes clearly show a noticeable increase in scores after using the Virtual Writing Tutor for the rewriting process or the revised version. The aforementioned rise highlights the effectiveness of incorporating online writing support resources into the educational structure, underscoring the crucial function of tailored criticism and direction in enhancing students' written communication skills. The scores for the original and revised essays show a clear trend of improvement, demonstrating the transformative power of using technology to support iterative refinement and enable students to improve the coherence, clarity, and persuasiveness of their arguments. These results support the intervention's efficacy and highlight the potential of creative

strategies for fostering the development of critical writing abilities that are essential for success in both the classroom and the workplace.

A number of steps were taken in order to assess the efficacy of the learning model: (1) acclimating the Virtual Writing Tutor to the user; (2) providing writing assistance for argumentative essays; and (3) actually using the Virtual Writing Tutor. The students were required to write an argumentative essay and use Virtual Writing Tutor to independently modify their writing twice as part of the implementation process. The following is a description of the research findings.

Based on the research results, the students who used Virtual Writing Tutor got better ability in writing their argumentative essays, as displayed in Figure 1.

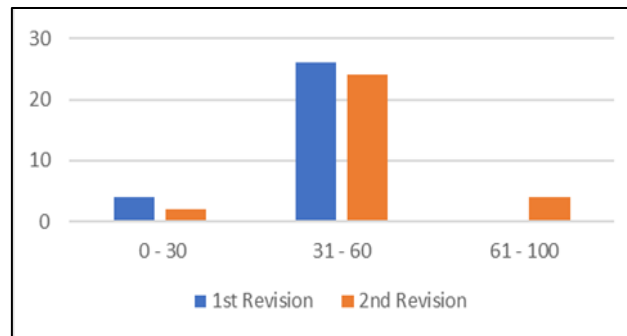


Figure 1. The students' argumentative essays scores

After an intensive review of the data, it is clear that students who used VWT demonstrated a significantly higher level of written expression competency than their peers who did not make use of the online writing support tool. This significant discrepancy highlights the critical role VWT plays in enhancing students' writing abilities by giving focused feedback, pointing out areas for development, and making helpful suggestions for improvement. Figure 1 provides a clear distinction between the performance levels of students who participated in VWT and those who did not, providing a visual demonstration of the concrete advantages gained from incorporating technology into the educational environment.

The diagram in Figure 1 shows that the students wrote their argumentative essays twice (the first version in the 1st revision and the second version in the 2nd revision). The scores of 0–30 represent the students' low writing ability, the scores of 31–60 represent their moderate writing ability, and the scores of 61–100 represent their high writing ability. Out of the 26 students, none of them achieved a high score. Four students have a low writing ability, and four students get high scores in the second revision's results. Meanwhile, the majority of the students (24 students) have a moderate writing ability. This demonstrates that using the Virtual Writing Tutor has improved the students' writing ability.

The Virtual Writing Tutor assesses the students' essay writing performance on a number of criteria, including vocabulary, grammar accuracy, and essay structure and substance. The first set of tests' results are shown in Figure 2.

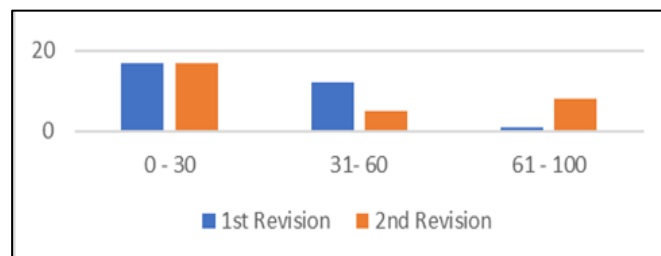


Figure 2. Percentage of the students' writing structure and content result

17 of 30 students who completed writing the argumentative essays got a percentage score between 0 and 30 for both the first and second revisions. In the meantime, 5 students (in the 2nd revision) and 12 students (in the 1st revision) got the scores between 31 and 60. In addition, one student in the first revision and eight students in the second revision got the scores between 61 and 100. Based on these findings, the students who used Virtual Writing Tutor show an improvement in their essays'

substance and structure. Furthermore, the assessment was also carried out on the students' vocabulary mastery in writing the argumentative essay. Figure 3 displays the vocabulary evaluation results on the students' argumentative essays.

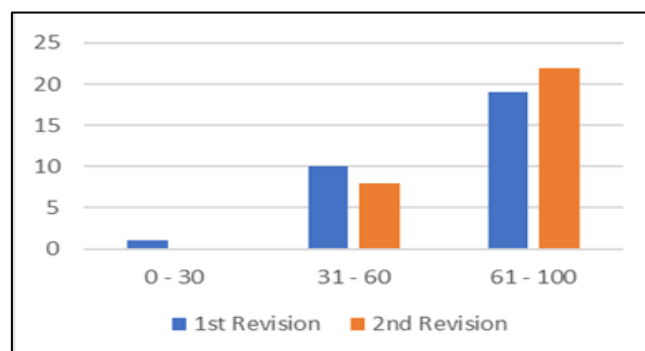


Figure 3. Percentage of students' vocabulary score

It is evident from the accompanying graphic in Figure 3 that the students' vocabulary scores have risen when they rewrote the argumentative essays. The students' increased scores were caused by the presence of vocabulary assessment feature as a guide for the students to revise their essays. There was only one student (in the 1st revision) who got a score between 0 and 30, and 10 students (in the 1st revision) and eight students (in the 2nd revision) who got a score between 31 and 60. Meanwhile, more students—19 students in the first revision and 22 students in the second revision—got a high score range (61–100). Moreover, as illustrated in Figure 4, language accuracy is the third factor assessed by Virtual Writing Tutor.

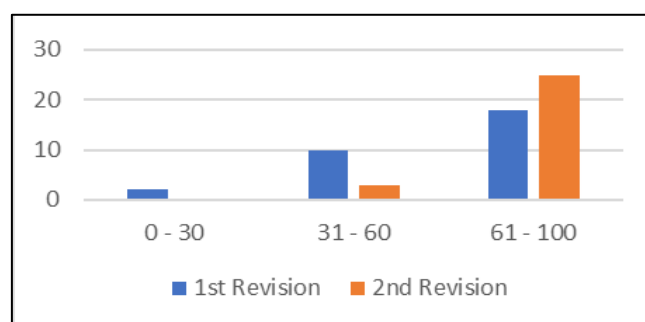


Figure 4. Percentage of students' language accuracy score

The results displayed in Figure 4 illustrate how the high scores – obtained by 18 students (in the 1st revision) and 25 students (in the 2nd revision) – dominated the students' argumentative essay writing results. This indicates that after utilizing the Virtual Writing Tutor, the students' linguistic accuracy has improved. In the meantime, only two students (in the 1st revision) got a low score range, and in the second revision none of the students got this score range.

Furthermore, a more thorough examination of the study results demonstrates a strong conclusion derived from the students' questionnaires and assessments: the incorporation of Virtual Writing Tutor (VWT) unquestionably enabled a notable improvement in students' ability to write strong argumentative essays. With the combination of quantitative information from evaluations and qualitative insights from student comments, a strong consensus is formed that VWT is essential to promoting real gains in writing skills. Using this online resource has shown to be crucial in giving students customized advice and assistance, thereby enhancing their ability to formulate well-reasoned arguments and persuasively support their positions.

The results of this study support earlier research by academics, which highlights the usefulness of Virtual Writing Tutor (VWT) in teaching writing (Al Badi et al., 2020; Perdana et al., 2023). They also add to the growing body of literature on the effectiveness of VWT as a pedagogical tool. This convergence of results from different studies highlights the strength of the evidence proving VWT's usefulness in a variety of writing genres. Whatever the particular writing genre being discussed, VWT proves to be a flexible and effective tool for improving students' writing skills. Beyond merely assisting

students come up with and arrange their ideas, VWT provides a comprehensive method of enhancing writing abilities that includes elements like vocabulary expansion, punctuation usage, grammar improvement, and precise diction. In addition to addressing writing's surface-level issues, VWT's all-encompassing support fosters a deeper comprehension of stylistic nuances and language mechanics, which helps students' writing abilities develop holistically. VWT plays a critical role in providing students with the fundamental skills required for effective communication and expression in academic, professional, and personal contexts by enabling them to hone their writing across multiple dimensions. As a result, the study's findings support the usefulness of VWT as a teaching tool and highlight how it can lead to students' writing proficiency changing for the better in a variety of learning environments.

Based on the assessment of the Virtual Writing Tutor's efficacy, the students' writing abilities have improved in the following ways. First, the students' writing has been checked for grammar and spelling mistakes, and based on the corrections supplied, they made the necessary corrections right away. Their writing talents have been always being enhanced. Second, the feedback has been given regarding the structure of the paragraphs, the development of the ideas, and the appropriateness of the arguments and supporting details utilized in the argumentative essays. Third, the students' vocabulary has expanded and they received guidance on writing more complex and well-structured sentences from the Virtual Writing Tutor. Fourth, the students now have a better understanding of the formats and conventions of writing argumentative essays such as introductions, thesis statements, argument building, and effective conclusions. Fifth, the students can use the online Virtual Writing Tutor at any time to support their autonomous learning and practice writing in accordance with their needs. Sixth, the performance evaluation and improvement can update the teachers on how well students are producing argumentative essays on a regular basis. This entails a teacher's evaluation or written assessments covering a range of subjects to determine whether students' writing and content comprehension have improved. Seventh, the ongoing instruction and guidance available in the Virtual Writing Tutor train the students to use this tool effectively in writing. Eighth, the Virtual Writing Tutor also facilitates the calculating user satisfaction indexes. The assessment done by the Virtual Writing Tutor confirms the previous literature that content, organization, vocabulary, language use, and mechanics are components of evaluation in writing (Hamp-Lyons, 1995; Klimova, 2011).

Although revisions are often applied in teaching writing, they can be useless if done without any clear guidance. Without a structured approach, students may struggle to identify and correct errors effectively, leading to repeated mistakes and limited progress. This confirms the previous study arguing that revisions in writing can only be effective if done using the right strategy (Rashtchi & Ghandi, 2011). Effective revision requires explicit instructions, targeted feedback, and systematic practice to refine students' writing skills. By using VWT, students are fully guided in doing their revisions because the platform provides comprehensive feedback on multiple aspects of their writing. VWT offers detailed insights into the structure of the paragraphs, ensuring logical coherence and well-organized content. It also aids in the development of ideas by highlighting areas that need further elaboration or clarity.

CONCLUSION

Based on the findings of this study, it can be concluded that several State Madrasah Aliyah (MAN) institutions in Medan City through the efforts of moral aqidah subject teachers—have taken significant and proactive steps to strengthen the ideological foundation of Islamic religious education amid the challenges of technological disruption. These efforts reflect a strong commitment to maintaining the relevance of religious education in a rapidly changing socio-technological landscape. The strategies identified include: (1) the formulation of clear and structured curricular steps to embed Islamic ideological values; (2) an emphasis on the need for adequate resources, including time, infrastructure, and human capital, to support implementation; (3) consistent efforts by teachers to cultivate students' critical thinking and reasoning abilities, which are essential for navigating complex moral and ethical issues in modern life; (4) the reinforcement of the understanding that human life should contribute meaningfully to society, not merely serve personal interests; (5) the cultivation of openness and tolerance by encouraging appreciation of diversity and difference; and (6) attention to individual students' skills and interests, allowing for more personalized and meaningful learning experiences. These findings underscore the adaptive capacity of teachers in religious education to respond to the shifting needs of students in the digital era. The role of the teacher goes beyond knowledge transmission; it involves being a moral guide and facilitator who fosters spiritual resilience,

social responsibility, and intellectual openness in learners. However, the research also acknowledges certain limitations, particularly in the narrow scope of data collection, as it relied on input from a limited number of informants. To deepen the understanding of how Islamic religious education is evolving in response to technological disruption, future studies should employ broader and more diverse qualitative methods such as ethnographic studies, focus group discussions, or multi-site case studies and involve a wider range of participants, including students, parents, and all subject teachers across various MAN institutions. The implications of this study point to the urgent need for institutional support in equipping religious educators with the tools and professional development opportunities necessary to thrive in a digital age. Strengthening collaboration among educators, curriculum developers, and policymakers will be key to ensuring that Islamic education not only retains its ideological foundation but also remains relevant and transformative for future generations. This research contributes to a growing discourse on integrating traditional values with contemporary pedagogical practices in Islamic education, highlighting the importance of adaptability, inclusivity, and context-sensitive strategies.

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AUTHOR CONTRIBUTIONS

The first author was responsible for conceptualization, methodology, formal analysis, and writing (original draft preparation). The second author conducted a formal analysis, prepared resources, and handled visualization. The third author was responsible for validation, writing (review and editing), and supervision. The fourth and fifth authors were involved in validation and formal analysis.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

REFERENCES

- Al Badi, A. A., Osman, M. E. T., & M. Al-Mekhlafi, A. (2020). The impact of virtual writing tutor on writing skills and attitudes of Omani College students. *Journal of Education and Development*, 4(3), 101-116. <https://doi.org/10.20849/jed.v4i3.828>
- Alamri, B. (2021). Challenges of implementing technology in ESL writing classrooms: A case study. *English Language Teaching*, 14(12), 36-43. <https://doi.org/10.5539/elt.v14n12p36>
- Alam, A. (2022). Employing adaptive learning and intelligent tutoring robots for virtual classrooms and smart campuses: reforming education in the age of artificial intelligence. In *Advanced computing and intelligent technologies: Proceedings of ICACIT 2022* (pp. 395-406). Singapore: Springer Nature Singapore.
- Amrani, A., & Ducq, Y. (2020). Lean practices implementation in aerospace based on sector characteristics: methodology and case study. *Production Planning & Control*, 31(16), 1313-1335.
- Basar, Z. M., Mansor, A. N., Jamaludin, K. A., & Alias, B. S. (2021). The effectiveness and challenges of online learning for secondary school students—A case study. *Asian Journal of University Education*, 17(3), 119-129.
- Binti M, M., & Adeshina, A. N. G. (2024). Exploring the Effectiveness of the Learning Cycle Model in Enhancing Mathematics Learning for Students. *Interval: Indonesian Journal of Mathematical Education*, 2(2), 99-105. <https://doi.org/10.37251/ijome.v2i2.1144>
- Bui, D. T., Hoang, N. D., Martínez-Álvarez, F., Ngo, P. T. T., Hoa, P. V., Pham, T. D., ... & Costache, R. (2020). A novel deep learning neural network approach for predicting flash flood susceptibility: A case study at a high frequency tropical storm area. *Science of The Total Environment*, 701, 134413.

- Chen, Y., Li, W., & Yi, P. (2020). Evaluation of city innovation capability using the TOPSIS-based order relation method: The case of Liaoning province, China. *Technology in Society*, 63, 101330.
- Escartín, J., Saldaña, O., Martín-Peña, J., Varela-Rey, A., Jiménez, Y., Vidal, T., & Rodríguez-Carballeira, Á. (2015). The impact of writing case studies: Benefits for students' success and well-being. *Procedia - Social and Behavioral Sciences*, 196, 47-51. <https://doi.org/10.1016/j.sbspro.2015.07.009>
- Fitriani, F., Triandafillidis, T., & Thao, L. P. (2023). Exploring the Integration of Computational Thinking and Mathematical Modelling in STEM Education. *Interval: Indonesian Journal of Mathematical Education*, 1(2), 73-82. <https://doi.org/10.37251/ijome.v1i2.1341>
- Gerot, L., & Wignell, P. (1994). *Making sense of functional grammar*. AEE Publishing.
- Graefen, B., & Fazal, N. (2024). From Chat bots to Virtual Tutors: An Overview of Chat GPT's Role in the Future of Education. *Archives of pharmacy practice*, 15(2-2024), 43-52.
- Hamp-Lyons, L. (1995). Rating nonnative writing: The trouble with holistic scoring. *TESOL Quarterly*, 29(4), 759-762. <https://doi.org/10.2307/3588173>
- Harwood, C., & Koyama, D. (2020). Creating a virtual writing center to support self-regulated learning. *Studies in Self-Access Learning Journal*, 11(3), 164-186.
- Hemachandran, K., Verma, P., Pareek, P., Arora, N., Rajesh Kumar, K. V., Ahanger, T. A., ... & Ratna, R. (2022). Artificial intelligence: A universal virtual tool to augment tutoring in higher education. *Computational Intelligence and Neuroscience*, 2022(1), 1410448.
- Herreid, C. (2006). Using case studies to teach science. In J. J. Mintzes & W. H. Leonard (Eds.), *Handbook of college science teaching* (pp. 177–193). NSTA Press.
- Hyskaj, A., Ramadhanti, A., Farhan, H., Allaham, A., & Ismail, M. A. (2024). Analysis of the Role of the Flo Application as a Digital Educational Media for Adolescent Reproductive Health in the Technology Era. *Journal of Educational Technology and Learning Creativity*, 2(1), 71-82. <https://doi.org/10.37251/jetlc.v2i1.1414>
- Kazanci, Z., & Okan, Z. (2009). Evaluating english language teaching software for kids: Education or entertainment or both? *Turkish Online Journal of Educational Technology*, 8(3), 30-38.
- Klimova, B. F. (2011). Evaluating writing in English as a second language. *Procedia - Social and Behavioral Sciences*, 28, 390–394. <https://doi.org/10.1016/j.sbspro.2011.11.074>
- Khuong, L. Q. (2022). Students' experience on learning English essay writing with teacher's application of online tools. *International Journal on E-Learning Practices (IJELP)*, 5, 23-30. <https://doi.org/10.51200/ijelp.v5i.4096>
- Liew, T. W., Tan, S. M., Pang, W. M., Khan, M. T. I., & Kew, S. N. (2023). I am Alexa, your virtual tutor!: The effects of Amazon Alexa's text-to-speech voice enthusiasm in a multimedia learning environment. *Education and information technologies*, 28(2), 1455-1489.
- Mashau, P., & Nyawo, J. (2021). The use of an online learning platform: A step towards e-learning. *South African Journal of Higher Education*, 35(2), 123-143. <https://doi.org/10.20853/35-2-3985>
- Mawardani, A., Mirunalini, M., Meechi, C., & Shah, S. (2023). Development of Interactive Multimedia Based on Adobe Flash as a Learning Media Steps of Geographical Research. *Journal of Educational Technology and Learning Creativity*, 1(1), 16-24. <https://doi.org/10.37251/jetlc.v1i1.620>
- Mukundan, J., & Nimehchisalem, V. (2011). Educational software and English teaching courseware: Promising panaceas? *Journal of NELTA*, 13(1–2), 71-79. <https://doi.org/10.3126/nelta.v13i1-2.4638>
- Nasution, R., Debora, M., Saragih, B., Gultom, J., & Lubis, S. (2023). Students' writing skill improvement through virtual writing tutor (VWT). *Asian TESOL Journal*, 3(1), 15-18. <https://doi.org/10.35307/asiantj.v3i1.42>
- Nguyen, T. T. K., Nguyen, M. T., & Tran, H. T. (2023). Artificial intelligent based teaching and learning approaches: A comprehensive review. *International Journal of Evaluation and Research in Education*, 12(4), 2387-2400. <https://doi.org/10.11591/ijere.v12i4.26623>
- O'Malley, J. M., & Pierce. (1996). *Authentic assessment for English language learners*. Addison-Wesley Publishing Company.
- Partnership for 21st Century Skills. (2007). *Framework for 21st century learning*. P21 Partnership for 21st Century Learning.

- Perdana, R. P., Hidayani, S., & Fitriana, R. (2023). Pemanfaatan artificial intelligence-virtual writing tutor untuk meningkatkan kemampuan menulis karya ilmiah guru di Kabupaten Serang, Banten. *Jurnal Respon Komunitas dan Pemberdayaan*, 1(1), 10-17. <https://jurnal.untirta.ac.id/index.php/jrpk/article/view/22316>
- Prince, M. J. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93(3), 223-231. <http://dx.doi.org/10.1002/j.2168-9830.2004.tb00809.x>
- Priya, A. (2021). Case study methodology of qualitative research: Key attributes and navigating the conundrums in its application. *Sociological Bulletin*, 70(1), 94-110.
- Rashtchi, M., & Ghandi, M. (2011). Writing revision strategies: Do they enhance writing ability? *Zmogus Ir Zodis*, 13(3), 67-80.
- Şahin, A., & Özenç, E. G. (2021). The use of educational software in teaching initial reading and writing. *International Journal of Progressive Education*, 17(4), 373-389. <https://doi.org/10.29329/ijpe.2021.366.23>
- Sibbald, S. L., Paciocco, S., Fournie, M., Van Asseldonk, R., & Scurr, T. (2021, September). Continuing to enhance the quality of case study methodology in health services research. In *Healthcare management forum* (Vol. 34, No. 5, pp. 291-296). Sage CA: Los Angeles, CA: SAGE Publications.
- Sinar, T. S., Budiman, M. A., Ganie, R., & Rosa, R. N. (2023). Students' perceptions of using Roblox in multimodal literacy practices in teaching and learning English. *World Journal of English Language*, 13(7), 146-153. <https://doi.org/10.5430/wjel.v13n7p146>
- Sriyati, S., Mukhaiyar, M., & Rosa, R. N. (2019). The effect of using insert strategy and motivation on the reading comprehension of the second grade students of SMPN 11 Sijunjung West Sumatera. *International Journal of Civil Engineering and Technology*, 10(1), 1359-1368.
- Tedjo, E. W. (2022). Providing online feedback using an AI proof-reading tool to enhance student surface-level writing skills. *EBONY: Journal of English Language Teaching, Linguistics, and Literature*, 2(1), 37-45. <https://doi.org/10.37304/ebony.v2i1.4040>
- Thomas, J. W. (2000). A review of research on project-based learning. learning. Available at http://www.bobpearlman.org/BestPractices/PBL_Research.pdf
- Thomas, J. W., Mergendoller, J. R., & Michaelson, A. (1999). *Project-based learning: A handbook for middle and high school teachers*. The Buck Institute for Education.
- Ukhova, L. V., Stepanov, V. N., Gaponova, Z. K., Boldyreva, E. M., & Kovaleva, N. A. (2021). Most effective educational technologies in the era of coronavirus: Case-study and e-learning Russian as a foreign language. *XLinguae*, 14(1), 62-72. <https://doi.org/10.18355/XL.2021.14.01.05>