AI as a Personalized Tutor: The Effectiveness of AI-Based Writing Training Models in Enhancing Santri Writing Skills

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Abstract. This research investigates the effectiveness of using artificial intelligence (AI) as a personalized tutor in improving the scientific writing skills of santri. By utilizing AI-based writing training models, this study aims to evaluate its impact on the quality of writing, understanding of structure, and analytical skills of the santri. A quantitative approach was used involving 35 As Salaam santri. This research examines the development and implementation of two AI-based tutor models aimed at improving the academic writing skills of santri (Islamic boarding school students). Book 1 emphasizes scientific writing structures, reference management with Mendeley, and statistical analysis using IBM SPSS, while Book 2 introduces AI tools like ChatGPT, Grammarly, and Quillbot for research and literature searches. Survey results indicate that while santri possess a strong understanding of writing structures, there are significant gaps in their knowledge of AI applications, citation management, and journal selection. A critical analysis highlights the importance of balancing AI use with critical thinking to avoid over-reliance on technology. The recommendation includes creating tailored versions of the module to suit varying skill levels and conducting regular evaluations to ensure its relevance. The pilot study suggests that AI integration can enhance writing efficiency, but must be managed to promote independent analytical thinking. This research contributes to the growing exploration of AI in education, offering innovative pathways for enhancing academic writing instruction.

Keywords: Artificial Intelligence, Tutor, Scientific Writing, Santri.

1 INTRODUCTION

The literacy level among Indonesia's Generation Z faces serious challenges, with the national literacy index reaching only 0.001%, according to UNESCO[1]. This fact shows that literacy in the digital age is not keeping pace with rapid technological development.

[1] Putri Limilia, Ras Amanda Gelgel, and Lintang Ratri Rahmiaji, 'Digital Literacy Among Z Generation in Indonesia', 2022, pp. 1–11, doi:10.15405/epsbs.2022.01.02.1.

W. Widyasari et al. (eds.), *Proceedings of the 2nd Ibn Khaldun International Conference on Applied and Social Sciences (IICASS 2024)*, Advances in Social Science, Education and Humanities Research 871,
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Generation Z tends to spend more time accessing the internet (an average of 8 hours and 42 minutes per day) than reading (only 8 minutes per day)[2]. This habit creates a significant gap between digital and traditional literacy skills.

Factors contributing to this low literacy rate include the habit of reading short content on social media, lack of access to books, and a weak literacy culture in families and schools. The impact is highly detrimental, hindering Generation Z's critical and logical thinking abilities and reducing their problem-solving skills, which in turn affects their development in various aspects of life. In facing this challenge, an approach that integrates literacy with digital technology is increasingly important. However, the use of technology is not without its challenges. The phenomenon of "task switching" due to disruptive notifications can reduce productivity by up to 40%[3]. While technology can facilitate access to reading materials, it can also impede deep and sustained reading processes.

To address this challenge, "digital mindfulness" approaches need to be implemented. This involves consciously and deliberately using technology, such as managing notifications, utilizing "focus mode" features, or setting specific times for uninterrupted reading[4]. Furthermore, developing digital literacy applications tailored to Generation Z's habits could be an effective solution. Applications that incorporate gamification elements can motivate continuous reading, while integrating short content with longer, more in-depth reading material can help bridge the literacy gap[5].

It is also important to consider the role of formal education in building digital literacy skills. Schools can integrate digital time management training and focus strategies into their curricula[6]. Through this holistic approach, improving the digital literacy of Generation Z in Indonesia can address the low interest in reading and writing, while also tackling digital distractions. In turn, this could contribute to improving the national

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[2] Rizky Ida Khalifatussalam, 'Low Literacy in Indonesia: Understanding and Factors That Influence It', *Low Literacy in Indonesia: Understanding and Factors That Influence It*, November, 2021, pp. 1–8.

[3] Florian Schmitz and Raimund J. Krämer, 'Task Switching: On the Relation of Cognitive Flexibility with Cognitive Capacity', *Journal of Intelligence*, 11.4 (2023), doi:10.3390/jintelligence11040068.

[4] Chih Hao Lin and Yao Yun Chang, 'A Progressive Digital Narrative Teaching Method to Improve Learning Motivation as a Lifelong Learning Skill', *Sustainability (Switzerland)*, 13.23 (2021), doi:10.3390/su132312991.

[5] Cecilia Ka Yuk Chan and Katherine K.W. Lee, 'The AI Generation Gap: Are Gen Z Students More Interested in Adopting Generative AI Such as ChatGPT in Teaching and Learning than Their Gen X and Millennial Generation Teachers?', *Smart Learning Environments*, 10.1 (2023), doi:10.1186/s40561-023-00269-3.

[6] Piatip Phuapan, Chantana Viriyavejakul, and Paitoon Pimdee, 'An Analysis of Digital Literacy Skills among Thai University Seniors', *International Journal of Emerging Technologies in Learning*, 11.3 (2016), pp. 24–31, doi:10.3991/ijet.v11i03.5301.

literacy index and developing a generation that is not only tech-savvy but also possesses strong literacy skills.

Effective writing skills are a crucial competence in the era of the Fourth Industrial Revolution. However, exposure to increasingly advanced gadget technology has led to a decline in writing abilities among the Indonesian population. This situation has become a concern for the government and educational institutions. One effort being made is the organization of training focused on honing literacy in creative writing. Mastering writing skills is not only important for career success but can also strengthen individuals' confidence in their abilities.

However, in reality, students' scientific writing skills still need improvement. Most students struggle with formulating questions, processing data, and making references[7]. The unique education of Generation Z, shaped by familiarity with digital technology, requires a different approach to developing their writing skills. Educational institutions must create learning environments that promote the development of digital literacy and technological proficiency, as well as provide opportunities for students to apply their learning in real-world practical contexts.

Santri (students in Islamic boarding schools), with their tradition of reading and memorizing texts, actually have a strong foundation in literacy. This aligns with the spirit of literacy reflected in Surah Al-Alaq verses 1-5, which emphasize the importance of reading and writing as a means of acquiring knowledge[8]. This tradition should give santri an advantage in literacy compared to Generation Z in general. However, reality shows that the literacy level of santri in some pesantren (Islamic boarding schools) in Indonesia remains low, even below the national average[9]. Thus, integration to enhance digital learning motivation among santri is necessary.

Integrating digital storytelling techniques, for example, can be a powerful tool to engage Generation Z learners and boost their learning motivation[10]. Understanding generational differences in learning preferences is also crucial for effectively adopting emerging technologies, such as generative AI, in higher education[11].

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[7] Maya Dewi Kurnia, Dian Permanaputri, and Sobihah Rasyad, 'Pelatihan Menulis Cerita Anak Pada Siswa Sdn Sadagori Cirebon Upaya Kembangkan Kreativitas Di Masa Pandemi', *Jurnal Berdaya Mandiri*, 4.1 (2022), pp. 886–97, doi:10.31316/jbm.v4i1.1781.

[8] Asma Abidah Al Aziz, 'Hubungan Antara Intensitas Penggunaan Media Sosial Dan Tingkat Depresi Pada Mahasiswa', *Acta Psychologia*, 2.2 (2020), pp. 92–107, doi:10.21831/ap.v2i2.35100.

[9] Muhammad Rijal Fadli and Siti Irene Astuti Dwiningrum, 'PESANTREN'S DIGITAL LITERACY: An Effort to Realize the Advancement of Pesantren Education', *ULUL ALBAB Jurnal Studi Islam*, 22.2 (2021), pp. 338–59, doi:10.18860/ua.v22i2.14221.

[10] Lin and Chang.

[11] Chan and Lee.

Generative AI, such as ChatGPT, holds great potential for enhancing critical thinking and writing literacy. AI can provide constructive feedback, help students correct grammar, sentence structure, and vocabulary, and offer exercises tailored to individual weaknesses. This allows students to focus on areas needing improvement, enhancing their critical thinking skills.

Generative AI can also assist students in research and report writing by providing examples of sentences, paragraph structures, and appropriate language. Furthermore, AI can tailor educational content to the individual needs and interests of students, making the learning process more effective and enjoyable. However, the role and support of teachers remain crucial to ensuring that students develop these skills effectively.

In this context, integrating digital literacy with santri's literacy traditions could be a potential solution. Using AI as a personal tutor to improve scientific article writing skills could bridge the gap between classical traditions and modern technology. The use of AI in pesantren learning can increase students' interest and ability in writing[12].

The limitations santri face in accessing digital literacy, particularly in writing scientific articles, can be overcome by utilizing AI models as personal tutors. However, in addition to providing access to technology, intensive training must also be given to santri so they can optimize AI use and independently develop their writing skills.

As an innovative step in learning, the use of AI personal tutors for santri is not just an aid but a new model for AI-based scientific article writing education. By utilizing AI, students can develop their writing skills with more personal and adaptive guidance, in line with advancing digital technology. This AI personal tutor is expected to be a solution in addressing literacy and scientific writing challenges among santri and improving the overall quality of education.

2 MATERIALS AND METHODS

This research employs a qualitative descriptive analysis method to assess the need for AI-based writing training models in enhancing the writing skills of santri (Islamic boarding school students). Primary data was collected through a structured questionnaire distributed to As Salaam santri, designed to identify their knowledge and understanding of writing scientific articles using Artificial Intelligence (AI). The questionnaire comprised five sections: respondent identity, santri's knowledge of AI, familiarity with AI tools, components of a scientific article, and knowledge of journals for publishing scientific work, using a five-point Likert scale. This method was integrated with participant observation and interviews to provide a more comprehensive understanding.

[12] Natalia Christy Waney, Wahyuni Kristinawati, and Adi Setiawan, 'Mindfulness Dan Penerimaan Diri Pada Remaja Di Era Digital', *Insight: Jurnal Ilmiah Psikologi*, 22.2 (2020), p. 73, doi:10.26486/psikologi.v22i2.969.

Data analysis was conducted using validity and reliability tests, with the research employing triangulation of sources and methods. Inductive reasoning was utilized through thematic analysis techniques, and the results were interpreted. The questionnaire results will serve as a crucial foundation for identifying specific needs for developing an AI model as a personal tutor, which will be materialized in the form of a learning module. This research method aligns with the approach recommended by Creswell [13] as well as Cohen [14], emphasizing the importance of integrating various data collection methods in qualitative research to gain a deep and comprehensive understanding of the phenomenon under investigation.

3 RESULT AND DISCUSSIONS

3.1 Santri Basic Knowledge about AI and Writing Skills

The findings from the survey conducted among the santri reveal a significant gap in knowledge regarding AI applications in academic writing, as well as a need for improvement in technical skills related to publication processes. The survey results indicate that santri have a basic understanding of various AI applications, but their ability to apply these tools effectively in scientific writing remains limited based score below.

Table 1. Result of Survey

No	Question	Score
1	Basic knowledge of various AI applications	2.2
2	Ability to identify relevant AI applications for scientific writing	2.6
3	Understanding of the structure of scientific articles	3.4
4	Ability to analyze research data and write it in the results of the discussion	3.2
5	Knowledge of how to summarize research results in conclusions	3.0
6	Understanding the importance of conveying suggestions in conclusions	3.6
7	Know the various forms of reference (body note, footnote, endnote)	2.8
8	How to automatically cite and include references using Mendeley	2.6
9	Know the types of scientific journals that are relevant for publication	2.8
10	How to choose the right journal for the publication of scientific papers	2.0
11	Understand the process of submitting articles to scientific journals	2.8
12	Know the criteria for articles accepted in scientific journals	2.8
13	Able to prepare scientific articles according to national and international journal standards	3.6

[13] John W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th edn (SAGE, 2014).

[14] Louis Cohen, Lawrence Manion, and Keith Morrison, *Research Methods in Education*, 8th edn (Routledge, 2018).

Data interpretation from the survey results reveals significant challenges in the utilization of AI technology and the scientific writing process among santri.

The data indicates that santri's basic understanding of various AI applications only achieved an average score of 2.2, suggesting that their knowledge is still at a rudimentary stage. Despite this generation's familiarity with digital technology, AI applications in an academic context seem to be underutilized. This low score highlights a significant gap in knowledge and skills regarding how to effectively use AI technology to support scientific writing activities.

Furthermore, santri's ability to identify relevant AI applications for scientific writing obtained a slightly higher score of 2.6. This suggests that although there is some awareness of AI applications such as ChatGPT, Quillbot, or Grammarly, their understanding of the most suitable applications for specific scientific writing needs is inadequate. This indicates a need for a more strategic approach in training santri to recognize and use the appropriate AI technology according to the academic context they face.

However, the data shows that santri's understanding of the structure of scientific articles is relatively good, with a score of 3.4. This means they have a strong foundation in understanding academic writing formats, such as the abstract, introduction, methods, results, and discussion sections. This understanding can be an important asset in further developing other technical skills, such as managing research data and integrating it into writing results. This also shows that although santri may be less skilled in technological aspects, they have a strong foundation in the formal rules of academic writing, which they can build upon through intensive training.

Nevertheless, despite their fairly good understanding of the article structure, the score for santri's ability to analyze research data and write it in the results and discussion sections only reached 3.2. This indicates that they may have difficulties in organizing the results of data analysis logically and in depth. Additionally, the low score of 2.6 on the ability to use Mendeley and other reference management tools reflects limitations in the technical aspects of managing citations and references. This is an important skill that needs to be developed because good reference management will improve the quality and integrity of their scientific writing.

Another significant weakness is santri's understanding of how to select the right journal for publication, which only achieved a score of 2.0. This low score is very concerning given the importance of targeted scientific publication for academic success. Santri need further guidance in the journal selection process, including how to assess the relevance of journals to their research topics, national and international journal standards, and the steps involved in submitting articles to suitable journals.

Moreover, understanding the article submission process and the criteria for accepted articles in scientific journals is still low, with scores of 2.8 respectively. This indicates that although santri may have a basic understanding of writing scientific articles, they need more in-depth training on the administrative and technical procedures for submitting articles to scientific journals. Knowledge of scientific journal criteria also needs to be improved so that santri can produce articles that meet the editorial requirements and strict standards of reputable scientific journals.

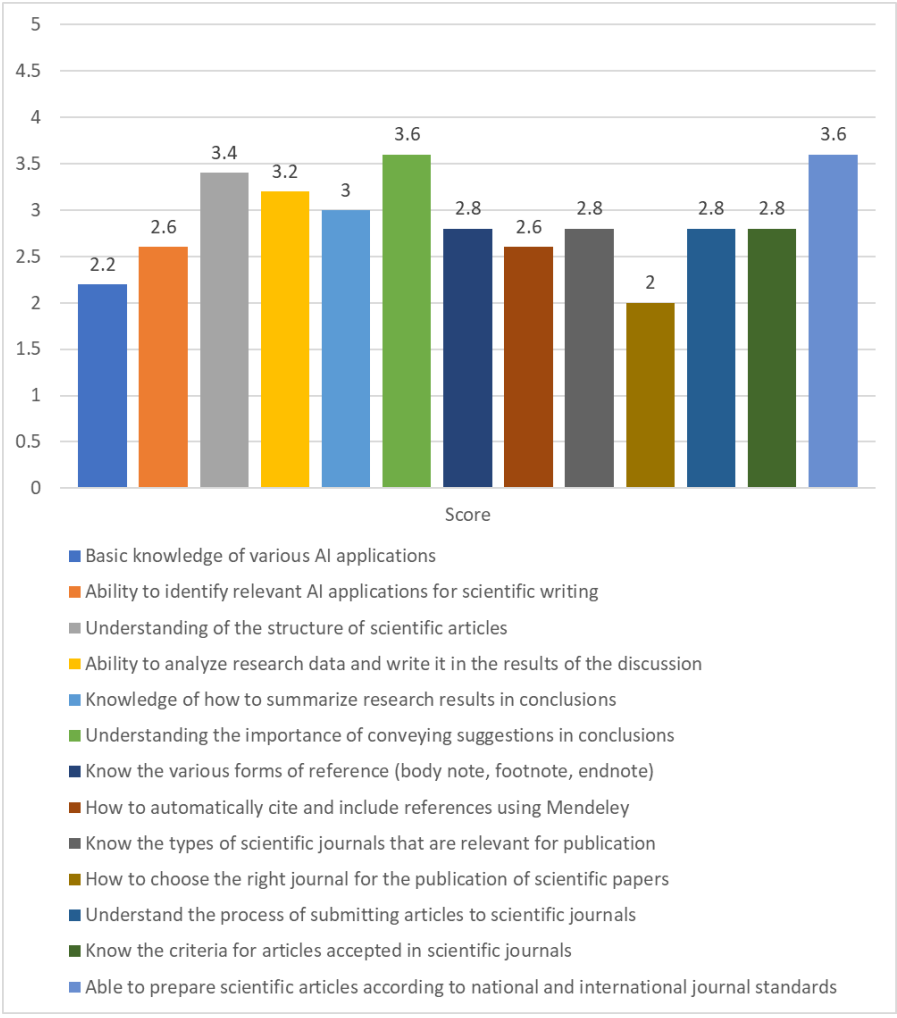

Figure 1. Santri Basic Knowledge about AI and Writing Skills

The graph presents a comprehensive overview of various skills related to scientific writing and AI applications, scored on a scale from 0 to 5. When interpreting these scores as percentages, we see a range of proficiency levels across different areas. The analysis reveals that the highest proficiencies lie in understanding the importance of conveying suggestions in conclusions and the ability to prepare scientific articles according to national and international journal standards, both reaching 72% (score of 3.6 out of 5). These are followed by understanding the structure of scientific articles at 68% (3.4/5) and the ability to analyze research data and write it in the results and discussion sections at 64% (3.2/5). Other skills such as knowledge of various reference forms,

understanding the process of submitting articles to scientific journals, and knowledge of criteria for articles accepted in scientific journals fall in the mid-range with scores of 2.8 out of 5 or 56%. Interestingly, basic knowledge of various AI applications is relatively low at 44% (2.2/5), while the ability to choose the right journal for the publication of scientific papers ranks lowest at 40% (2.0/5). This data reveals that although there are relative strengths in the structural understanding of scientific writing, significant gaps exist in technical abilities and the utilization of AI technology. It indicates a need for more intensive guidance and training in utilizing AI in the academic writing process, from reference management to selecting the right journals, as well as a comprehensive training approach that focuses not only on technical skills but also on a deep understanding of the scientific publication process to improve quality and competitiveness in the international academic arena..

Thus, the interpretation of this data leads to the conclusion that although santri have a strong foundation in the structural understanding of scientific writing, there are significant gaps in technical abilities and the utilization of AI technology[15]. They require more intensive guidance and training to utilize AI in the academic writing process, from reference management to selecting the right journals. Furthermore, a comprehensive training approach, which focuses not only on technical skills but also on a deep understanding of the scientific publication process, is essential to improve their quality and competitiveness in the international academic arena.

Based on these findings, an AI-based writing tutor should Provide comprehensive AI training: Offer in-depth training on various AI tools and their applications in academic writing[16], Address specific skill gaps: Focus on areas where santri need the most support, such as citation management and journal selection, Build on existing knowledge: Leverage santri's understanding of academic writing structures to introduce more advanced concepts and techniques, Promote critical thinking: Encourage santri to use AI as a tool to enhance their own critical thinking and writing skills, rather than relying solely on the AI to generate content.

3.2 AI as a Personalized Tutor

Based on the two AI model books, we can observe a comprehensive approach to enhancing santri's scientific writing abilities using AI technology. Both books offer a structured framework designed to provide a gradual learning experience on utilizing AI tools in the scientific writing process. This analysis will outline key points and provide interpretations of the approaches and objectives presented in each book.

Book 1. AI as a Personal Tutor for Scientific Writing

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[15] Andy Nguyen and others, 'Human-AI Collaboration Patterns in AI-Assisted Academic Writing', *Studies in Higher Education*, 49.5 (2024), pp. 847–64, doi:10.1080/03075079.2024.2323593.

[16] Marheny Lukitasari and others, 'Constructing Digital Literacy Instrument and Its Effect on College Students' Learning Outcomes', *International Journal of Instruction*, 15.2 (2022), pp. 171–88, doi:10.29333/iji.2022.15210a.

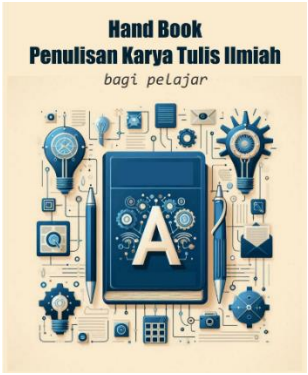

Figure 2. Book 1: AI as a Personal Tutor for Scientific Writing

The first book covers essential components of academic writing such as abstracts, introductions, methods, discussions, conclusions, and the use of reference management tools like Mendeley. Additionally, it introduces statistical software like IBM SPSS, which is crucial for data analysis in research. The approach clearly integrates AI technology into every stage of the scientific writing process. For instance, Mendeley serves as a valuable tool to help santri efficiently manage references, an essential part of research-based writing. Meanwhile, using SPSS demonstrates an effort to teach santri how to process and analyze data using valid statistical tools. In the context of santri education, combining statistical analysis with AI creates a balance between technological literacy and the traditional writing skills they learn in pesantren.

However, a major challenge in implementing this book is the potential complexity that may not be suitable for all santri, especially those with limited statistical understanding. Intensive training in using SPSS is necessary for santri to maximize the functionality of this tool in their academic research.

Book 2. AI for Student Research and Literature Search

Figure 3. Book 2: AI for Student Research and Literature Search

The second book presents a more focused module on introducing AI tools and how to use them in the research process. There are three main chapters in this book: Chapter 1 on accessing and setting up AI tools, Chapter 2 on using AI for student research, and Chapter 3 covering literature search tools.

The structure of this book reflects a gradual approach to integrating AI into academic writing. The AI tools introduced in this module include ChatGPT, Perplexity, Jenni, Humata, Grammarly, and Quillbot, each with a specific function in supporting the scientific writing process. The use of ChatGPT, for example, is very beneficial in helping santri develop initial ideas for their research, while Quillbot can improve grammar and writing flow. This feature demonstrates that AI is used at every stage of the writing process, from brainstorming to final revisions, allowing santri to receive personalized feedback to improve their work[17].

Nevertheless, there is a concern that the abundance of these tools may overwhelm santri who are new to AI, so it is important to ensure that their use is balanced and does not diminish their critical thinking abilities. This approach must also be considered in the context of religious education, where ethical values and academic integrity are highly valued. AI can help speed up the writing process, but this module clearly emphasizes the importance of avoiding plagiarism and upholding ethical standards in the use of this technology.

Overall, these two model books demonstrate a holistic approach to utilizing AI as a personal tutor in scientific writing for santri. The first book focuses more on the structure of scientific articles, reference management, and data analysis using statistical tools like SPSS, while the second book introduces AI tools that assist in research and literature search. This gradual approach allows santri to acquire a basic understanding of AI and then develop more specific skills in using technology for academic writing.

The success of implementing this model depends on how well the AI tools are integrated with santri's existing critical thinking skills and basic writing abilities. Therefore, it is essential to maintain a balance between the use of technology and the development of analytical thinking skills, so that santri do not become overly reliant on AI to generate content, but rather use AI as a tool to support their learning and development.

Although this module has great potential to improve santri's digital literacy and scientific writing skills, some aspects require further attention[18]. For example, the effectiveness of personalized feedback in the context of religious education needs to be further evaluated. Additionally, providing additional training for the use of tools such as SPSS and Mendeley, as well as understanding the ethics of using AI, will be key to ensuring the long-term success of this module.

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[17] Daijin Yang and others, 'AI as an Active Writer: Interaction Strategies with Generated Text in Human-AI Collaborative Fiction Writing', *CEUR Workshop Proceedings*, 3124 (2022), pp. 56–65.

[18] Iyus Yosep and others, 'Types of Digital Mindfulness: Improving Mental Health Among College Students – A Scoping Review', *Journal of Multidisciplinary Healthcare*, 17.January (2024), pp. 43–53, doi:10.2147/JMDH.S443781.

3.3 Discussion

The integration of Artificial Intelligence (AI) as a personal tutor in scientific writing holds tremendous potential for improving students' writing skills, particularly among santri (Islamic boarding school students). However, its successful implementation requires a strategic focus on several key recommendations. This critical analysis explores the essential recommendations aimed at optimizing the AI Tutor Model's overall effectiveness.

Conducting a Pilot Study to Evaluate the Module's Effectiveness

A crucial first step is the execution of a pilot study to empirically assess the module's effectiveness. This pilot study will enable the development of an evidence-based approach, where collected data provide a comprehensive view of the strengths and weaknesses of the module's initial implementation[19]. Through such a study, developers can evaluate various aspects, such as students' comprehension of the material, the suitability of AI for different writing tasks, and the module's impact on enhancing santri's critical thinking abilities.

This pilot study can also identify gaps in the teaching methodology that may not have been evident during the planning phase. For instance, the results might reveal that some students struggle with understanding statistical tools integrated into the module, necessitating revisions in instruction or supplemental material[20]. Furthermore, these findings can help refine the module to be more relevant and accessible to students with varying skill levels. Implementing the module without such an evaluation carries the risk of ineffectiveness[21], as it may not meet the actual needs of its users.

Developing Guidelines to Balance AI Use with Critical Thinking Skills

The use of AI in education can significantly enhance efficiency and accuracy in writing, but a major challenge lies in ensuring that students' critical thinking skills are not diminished. While AI is highly capable of facilitating technical aspects of writing—such as grammar, sentence structure, and even generating initial ideas—it cannot replace the analytical thought processes necessary for scientific writing[22].

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[19] Marzuki and others, 'The Impact of AI Writing Tools on the Content and Organization of Students' Writing: EFL Teachers' Perspective', *Cogent Education*, 10.2 (2023), doi:10.1080/2331186X.2023.2236469.

[20] Sigit Purnama and others, 'Does Digital Literacy Influence Students' Online Risk? Evidence from Covid-19', *Heliyon*, 7.6 (2021), p. e07406, doi:10.1016/j.heliyon.2021.e07406.

[21] Tohir Solehudin, Retno Triwoelandari, and Ahmad Mulyadi Kosim, 'Pengaruh Media Pembelajaran Menggunakan Aplikasi Prezi Terhadap Karakter Rasa Ingin Tahu Siswa', *Jurnal Penelitian Pendidikan*, 36.1 (2019), pp. 28–34.

[22] Dian Toar Y. G. Sumakul, Fuad Abdul Hamied, and Didi Sukyadi, 'Students' Perceptions of the Use of AI in a Writing Class', *Proceedings of the 67th TEFLIN International Virtual Conference & the 9th ICOELT 2021 (TEFLIN ICOELT 2021)*, 624 (2022), pp. 52–57, doi:10.2991/assehr.k.220201.009.

Therefore, developing clear guidelines for balancing AI utilization with critical thinking is essential[23]. These guidelines should include limitations and strategies to ensure students do not become overly reliant on AI to complete their tasks. For instance, students could be instructed to use AI for organizing ideas or grammar checking, but they should still be expected to independently perform deep analysis and synthesize information[24]. Without these guidelines, students risk over-reliance on AI to generate content, which would ultimately hinder their problem-solving abilities and creativity.

Considering the Development of Tailored Versions for Different Student Levels

Recognizing the varying levels of students' skills is a critical factor in the development of any learning module. The recommendation to create tailored versions of the AI Tutor module for different skill levels is highly relevant[25]. Some students may already have a foundational understanding of AI and how to apply it in academic writing, while others may be entirely new to the technology. Therefore, a one-size-fits-all module is unlikely to be effective in addressing the needs of all students.

Developing tailored versions of the module will ensure that each student can learn at a pace that is appropriate for their skill level. More advanced students could be introduced to complex topics, such as advanced statistical analysis or AI programming techniques, while beginners could focus on the basics of AI usage in writing. This ensures a more personalized and effective learning experience, ultimately improving outcomes. Additionally, the flexibility to adapt the module allows students to gradually deepen their skills, advancing progressively as their competencies grow[26].

4. Regular Evaluation and Updating of the Module

A learning module designed to support technological education, such as AI, must be flexible and continually evolving in line with technological advancements and user needs. AI technology is advancing rapidly[27], and what is relevant today may become obsolete within a few years. Therefore, regularly evaluating the module is essential to ensure that the content and teaching methods remain up-to-date and relevant.

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[23] Waverly Tseng and Mark Warschauer, 'AI-Writing Tools in Education: If You Can't Beat Them, Join Them', *Journal of China Computer-Assisted Language Learning*, 3.2 (2023), pp. 258–62, doi:10.1515/jccall-2023-0008.

[24] Lukitasari and others.

[25] Andy Coenen and others, 'Wordcraft: A Human-AI Collaborative Editor for Story Writing', 2019, 2021 <http://arxiv.org/abs/2107.07430>.

[26] Daphne Ippolito and others, 'Creative Writing with an AI-Powered Writing Assistant: Perspectives from Professional Writers', 2022, pp. 1–18 <http://arxiv.org/abs/2211.05030>.

[27] Yejin Bang and others, 'A Multitask, Multilingual, Multimodal Evaluation of ChatGPT on Reasoning, Hallucination, and Interactivity', 2024, pp. 675–718, doi:10.18653/v1/2023.ijcnlp-main.45.

Ongoing evaluation should include reviewing the effectiveness of the AI tools used, whether new innovations are more beneficial, and gathering student feedback regarding challenges they face or skills they feel are underrepresented[28]. Regular updates to the module ensure that it remains not only relevant but increasingly effective as improvements are made based on feedback and evaluation. Additionally, continuous evaluation allows developers to adjust the module to shifting educational dynamics, such as new trends in scientific writing or academic policies affecting AI use.

Research Limitation

The study's limitations stem from a relatively small sample size and potential overreliance on AI tools. The limited sample of 35 santri from As Salaam may restrict the generalizability of the findings to a broader population. Additionally, the study raises concerns about students becoming overly dependent on AI for writing tasks, potentially hindering the development of critical thinking and independent analysis. Technological barriers, such as limited access to digital tools and lack of prior experience with AI applications, may also have influenced the results. Moreover, the ethical implications of using AI in education, including the risk of plagiarism, require further exploration. Future research should address these limitations by incorporating larger, more diverse samples, investigating the long-term impacts of AI on critical thinking, and developing guidelines for the ethical use of AI in educational settings.

Looking towards future research, there are exciting avenues to explore, particularly in light of the two books mentioned: "AI as a Personal Tutor for Scientific Writing" and "AI for Student Research and Literature Search". For the first book, future studies could focus on longitudinal assessments of how AI tutoring impacts scientific writing skills over time. Researchers could design experiments comparing the effectiveness of AI-powered tutoring systems against traditional teaching methods, exploring how these systems can be personalized to cater to individual learning styles and existing skill levels. It would also be valuable to investigate potential biases in AI tutoring systems and their effects on learning outcomes. Regarding the second book, future research could evaluate the efficiency and accuracy of AI-powered literature searches compared to conventional methods. Studies could explore how AI assists students in identifying research gaps and formulating novel research questions, potentially leading to more original and higher-quality academic papers. There's also scope to examine how AI tools can be seamlessly integrated into existing academic curricula to enhance overall research skills.

More broadly, future research should address the long-term retention of skills acquired through AI-assisted learning in scientific writing. This could involve follow-up studies with participants to assess how well they maintain and apply these skills over

[28] Fenti Defita Sari, Supeno, and Zainur Rasyid Ridlo, 'Pengembangan LKPD Berbasis Question Prompt Scaffolding Untuk Meningkatkan Scientific Writing Skill Peserta Didik Pada Pembelajaran IPA SMP', *Cetta: Jurnal Ilmu Pendidikan*, 6.3 (2023), pp. 500–515, doi:10.37329/cetta.v6i3.2536.

time. Ethical considerations in using AI for academic writing and research is another critical area for investigation, particularly as these tools become more sophisticated and widely adopted. Researchers could explore the impact of AI writing tools on academic integrity and work towards developing comprehensive guidelines for their ethical use in educational and research settings. Additionally, studies on how AI can improve peer review processes in academic publishing could provide valuable insights for the scientific community. By pursuing these research directions, we can gain a deeper understanding of how AI can be effectively and ethically integrated into scientific writing and research processes, ultimately enhancing the quality and efficiency of academic work.

4 CONCLUSION

The AI model books for academic writing offer a comprehensive framework for integrating Artificial Intelligence into the educational journey of santri in scientific writing. Book 1 focuses on essential academic writing structures and the technical tools necessary for managing references and conducting statistical analyses, while Book 2 introduces AI tools for student research and literature search, providing step-by-step guidance for their effective use. Together, these books create a progressive and personalized learning experience by incorporating AI into every stage of the writing process.

However, for the full potential of these AI models to be realized, several key considerations must be addressed. There is a pressing need to ensure a balance between AI use and critical thinking skills to prevent over-reliance on technology. Tailoring the module to accommodate students with varying skill levels is crucial to providing a personalized and effective learning experience. Additionally, regular evaluations and updates will help ensure the module remains relevant and up-to-date with technological advancements and educational needs.

The AI Tutor model for academic writing presents enormous potential to improve students' writing skills, but like any educational technology, it must be implemented with caution and care. Over-reliance on AI, or its unbalanced use, may hinder students' development of critical thinking skills. Hence, clear guidelines are necessary to navigate the fine line between AI assistance and human analytical capabilities. Additionally, personalizing the module according to students' skill levels will significantly help ensure that each individual gains maximum benefit from the program. Regular evaluation and updates will be key to maintaining the relevance and effectiveness of the module in supporting students' academic writing skills. In summary, while the AI tutor models present a promising and innovative approach to enhancing students' scientific writing skills, their success depends on thoughtful implementation, ongoing adjustments, and a strong focus on fostering critical thinking alongside AI-supported learning.

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