

THE USE OF AI AND TECHNOLOGY TOOLS IN DEVELOPING STUDENTS' ENGLISH ACADEMIC WRITING SKILLS

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Abstracts

The rapid advancement of technology tools, particularly Artificial Intelligence (AI), has led to the integration of technology-assisted learning media into educational settings. This study focuses on the utilization of AI and technology tools by students in the process of English academic writing and its impact on their writing skills. Employing a qualitative approach, data was gathered through open-ended questionnaires and semi-structured interviews involving 73 English education students at an Islamic University in Indonesia. The findings of the study revealed that students employed a total of 15 technology tools, categorized into four types: language structures, sources, saving tracks, and references. According to the participants, the tools used by the participants were able to provide: direct feedback and correction, writing skills development. Specifically, the participants claimed that the tools enhance their understanding of grammatical rules and vocabulary acquisition. In addition, the participants considered that the tools help them to write a more cohesive and coherent essay. This study implies that the incorporation of technology tools in English academic writing has the potential to revolutionize the development and evaluation of writing skills. However, it is essential for students to strike a balance between leveraging these tools and honing their writing skills to ensure writing development.

Keyword:

English Academic Writing, AI and Technology, Technology Tools

Introduction

Technology is a powerful tool that significantly impacts various aspects of society, including education. Its potential to enhance the quality of education in Indonesia was recognized when the country hosted the G20 summit in 2022 (Syahril 2022). Therefore, the integration of technology in education, especially in the context of English teaching and learning, is crucial. In English teaching, technology has emerged as a primary medium to facilitate the delivery of authentic materials (Huang, Qi, and Xie 2022). Utilizing technology can provide better learning conditions and environments by involving the contribution of teachers and students (Audrain et al. 2022). Technology can provide the convenience of supporting English education. According to Hidayat et al. (2022), using technology strives to provide proper English learning for Indonesian students. The technology could assist English teachers and students with available learning references (Arif and Handayani 2021). Hence, technology-assisted learning media can support students in English classrooms, particularly in academic writing.

Nowadays, students are frequently referred to as "digital natives" because of their natural knowledge and comfort with technology. Students as part of digital native have digital competencies to extend their usage of technology tools (Elnadeef 2023), especially for academic writing in English. The study conducted by Gayed et al. (2022) showed that students have availability and accessibility to engage their writing process and technology tools. Also, the study conducted by Hajimaghsoodi and Maftoon (2020) discovered that the use of technology tools for writing has fostered the development of students' writing which it integrates with educational curricula. In line, the study conducted by Faisal and Carabella (2023) showed that the use of technology for academic purposes, prompting students to become proficient in using technology tools for their English writing. According to Kurniati and Fithriani (2022), students consider technology tools to improve their English writing experience by allowing them to easily edit, and collaborate. Thus, students as digital native can contribute to utilize AI and technology for English academic writing.

In this study, technology-assisted learning media refers to technology tools, including software or applications, that incorporate Artificial Intelligence (AI) technology. Artificial intelligence (AI) refers to the field of computer science that focuses on creating intelligent systems capable of performing writing tasks (Ribeiro 2021). AI-based technology tools have gained immense significance in English academic writing. The study by Lu (2019) indicated that English students who use AI in writing process can receive assistance in grammar and language correction, aiding in the identification and rectification of errors. Additionally, AI technology tools can help students identify plagiarism in academic writing (Khabib 2022) and guide them in adapting their English writing to specific styles, such as formal or informal (Fitria 2023). The integration of technology tools and writing skills is becoming increasingly necessary. In line with study by Rahman et al. (2022), students showed positive influence in using AI-based technology for correcting and provide feedback in writing process.

The use of AI and technology embraces specific types of technology tools that could assist students' writing. According to Wen and Walters (2022), technology tools could use in writing, such as word processing, online tools, mobile technology, and assistive technology. Kawinkoonlasate (2021) mentioned that e-writing could be employed in the writing classroom by involving students in writing with proper steps. Andina et al. (2019) mentioned that several writing software technologies, such as Microsoft Word, Google Docs, Grammarly, Turnitin,

and Correct English, could assist students' writing process. Also, much AI-based technology could encourage students' writing by providing the easiness for directing the writing (Gayed et al. 2022). Artificial Intelligence (AI) become popular by providing many technology tools for academic writing, including QuillBot, DeepL, Google Translate, ChatGPT, and others (Chen 2023). English teachers and students could employ suitable technology tools in an academic writing classroom. Hence, AI and technology supports students' English academic writing.

English academic writing is a critical component for students in higher education. By conducting academic writing, students could deliver their ideas, evidence-based arguments, and clarity to communicate with academic communities (Husin and Nurbayani 2017). In Indonesian context, students got academic writing course in university level. The study by Aunurrahman et al. (2017) showed that English academic writing course need substantial meeting in Indonesian universities setting to support students writing independently by embracing their critical thinking. English academic writing emphasizes critical thinking and the development of original ideas through analysis and synthesis of existing research (Bram and Angelina 2022). Thus, English students in higher education need to create academic writing for supporting their academic professional. As stated by Wastama et al. (2023), students need to create English academic writing since it can help to convey professionalism and intellectual rigor. Hence, mastering the conventions of English academic writing is crucial for Indonesian students, enabling effective communication and knowledge dissemination.

English academic writing is crucial for Indonesian students at the university level becomes necessary to invigorate students' writing skills. Unfortunately, many English language learners encounter challenges in producing proper academic writing. Ratnawati et al. (2018) highlight issues related to language structure, coherence, and cohesion that students face when engaging in English academic writing. Students found problems with grammar, generating ideas, and appropriate vocabulary in English academic writing (Toba, Noor, and Sanu 2019). To address these difficulties, the integration of AI and technology has proven to be beneficial. According to Mali (2022), technology can serve as a valuable tool to assist students in overcoming challenges during English academic writing. By integrating technology, students can engage in collaborative writing processes that foster critical thinking skills and self-assessment, as emphasized by Inderawati et al. (2019). The study by Hajimaghsoodi and Maftoon (2020) highlighted that the use of technology in the writing classroom has been shown to enhance students' writing achievement and produce higher-quality of writing. Therefore, AI and technology has potential in supporting students in English academic writing.

In English academic writing, AI and technology has emerged as a significant approach to improving students' writing skills. Technology tools enable students to enhance their understanding of academic writing development within specific topics of writing (Cardon et al. 2023). The study by Fatimah (2019) pointed out that technology greatly influences students' academic writing. By incorporating tech-assisted learning, English teachers can provide authentic materials and offer direct feedback on students' writing (Kawinkoonlasate 2021). Tech-assisted writing activities can improve students' motivation and autonomy in the classroom process (Al-Shehab 2020). Implementing technology in writing classroom improves students' writing activities, including vocabulary selection, grammar, and thinking ability (Shayakhmetova et al. 2020). The tech-assisted media is suitable for students' writing activities since students and teachers can adjust and develop activities (Sariani, Khairat, and Yaningsih

2021). Thus, English writing classrooms can implement technology-assisted learning media to enhance the learning quality of students' writing process (Zou, Kong, and Lee 2021).

Implementing AI and technology contributes to reinforcing students' writing academic skills. As stated by (Shayakhmetova et al. 2020), technology tools enable students to access ample information and collaborate in the writing process, facilitating the proper expression of ideas and the development of writing skills. Besides, Wen and Walters (2022) write that utilizing technology could promote students' writing performance by evolving the quality and quantity of the writing content. The technology could influence students' writing processes related to the concept and critical thinking (Sariani et al. 2021). Similar study conducted by Linh and Ha (2021) emphasize that technology tools develop students' ideas in designing their writing about the topic, content, cohesion, coherence, and accuracy. Implementing tech AI-based technology tools promotes students to recognize the error and improve the result of English academic writing (Fitria 2023); it gives opportunities for students to learn more about grammar or vocabulary. Likewise, Nurmayanti and Suryadi (2023) indicated that technology tools could help students generate English academic writing with new forms without changing the meaning and direct students to learn more.

Despite the potential benefits, the use of AI and technology in the writing classroom can present challenges, as evidenced by various studies. Hajimaghsoodi and Maftoon (2020) highlight the need for integration of technology tools with the curriculum and pedagogy, emphasizing the importance of selecting writing activities that effectively incorporate technology. Study by Al-Shehab (2020) emphasizes that both teachers and students must have clear learning objectives to guide their use of technology-assisted learning media for English writing. Several issues arise when implementing technology in writing. Technical problems and unreliable internet connections hinder students' seamless use of technology tools for writing (Hajimaghsoodi and Maftoon 2020; Huang et al. 2022). Additionally, Perkins (2023) mentioned that the drawbacks of using AI-based technology tools in academic writing could direct in an instant result of plagiarism if students could not use their ability to understand the content of writing. The easiness of AI and technology can make students rely on auto-correction, which make student empty-headed if they do not comprehend the process (Ismael et al. 2022). Thus, using AI and technology in English academic writing needs to consider many things, particularly in Indonesia.

Previous studies related to the issues of using AI and technology in writing classrooms prove usefulness for students. Wen and Walters (2022) mentioned that technology provides students to increase their ideas in English writing performance. The study by Linh and Ha (2021) emphasizes that students' writing could develop by facilitating AI and technology. Technology tools have become an agent in teaching writing since they could promote students' academic writing (Gayed et al. 2022). Additionally, students could get knowledge and information to compose ideas in writing products. As noted by Setyani et al. (2023), AI-based technology tools could encourage students to deliver their ideas in English academic writing. Implementing technology in the writing classroom could encourage students to have excellent English writing skills (Kawinkoonlasate 2021). Besides, the study conducted by Inderawati et al. (2019) showed that integrating technology into the academic writing process could direct students to have a high spirit in expanding their knowledge and ideas.

Technology has become a part of life, especially for English teaching and learning purposes. English academic writing is essential for higher education students to indicate their

semi-structured interviews were adapted from Al-Habsi et al. (2022), Kawinkoonlasate (2021), and Andina et al. (2019). The interview session contains 12 questions to collect complete data and reinforce the questionnaire data

The analysis of qualitative research used the design by Miles et al. (2014). It consists of three primary data analysis stages: data condensation, display, and conclusion. The researcher conducted each step to obtain actual data from raw data until presenting findings of the issues related to AI and technology in students' English academic writing.

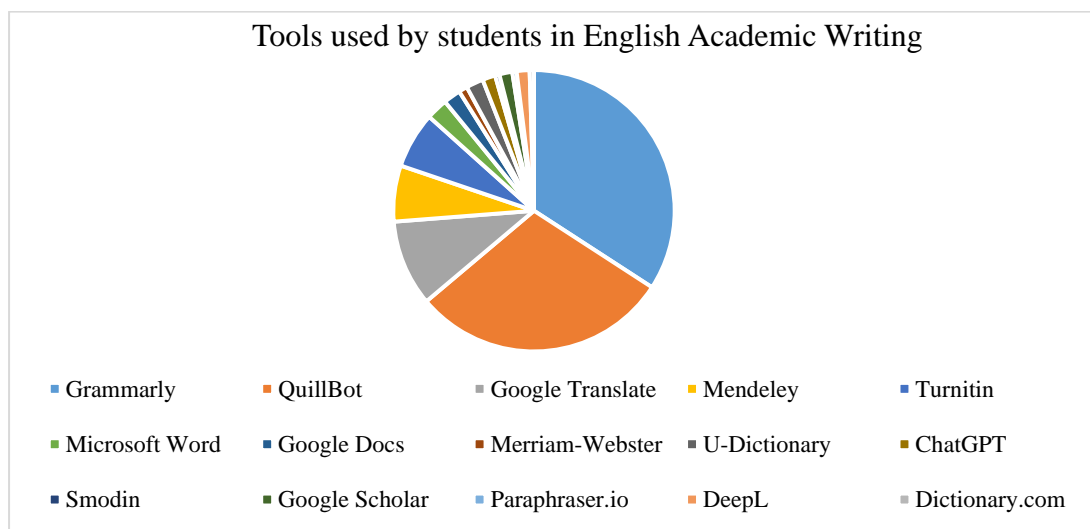
Results and Discussion

Results

Technology Tools in English Academic Writing

The result of technology tools showed the various types used by students in the English academic writing process. The students freely mentioned the technology tools they used to support their writing process. There were 15 technology tools of AI and technology used in English academic writing, and it consists of Grammarly, QuillBot, Google Translate, Mendeley, Microsoft Word, Google Docs, Merriam-Webster, U-Dictionary, Smodin, Google Scholar, Paraphraser.io, and DeepL. The technology tools are divided into four categories based on their functions, namely language tools, sources, saving track, and references which include in academic writing digital tools refer to a study by Schcolnik (2018). The explanations were as follows:

Chart 1. The Result of Tools in AI and technology



Based on the chart, fifteen technology tools are used by students in English academic writing. Those tools were divided into four categories based on the different functions used in writing. The most popular technology tools are Grammarly and QuillBot. It mentioned that *"The technology tools I use in English academic writing are Grammarly and QuillBot"* (Student9)

The other students used various AI and technology in English academic writing, and students utilized many media technology to assist them in the English academic writing process. It stated that

"Grammarly, ChatGPT, QuillBot, Google Docs, Microsoft Word, Google Translate" (Student18)

The tools of AI and technology have different functions for students to use in English academic writing; as stated above, the technology tools were divided based on the different purposes. In this study, the researcher found the four types of tools used mainly by students in their English academic writing process. The following is the explanation of the tool's function of AI and technology based on students' experiences:

Table 1. Technology Tools' Functions used in English Academic Writing

	Tools	Functions
Language Tools	Grammarly	<i>"Grammarly is to check grammar and spelling in English structures and correct errors in writing." (Student38)</i>
	QuillBot	<i>"QuillBot helps me paraphrase my sentences to avoid plagiarism." (Student6)</i>
	Smodin	<i>"To paraphrase and check grammar." (Student 21)</i>
	Parapharser.io	<i>"To correct my writing and find the accurate writing reference." (Student71)</i>
	Google Translate	<i>"Google Translate is usually used to translate unfamiliar words." (Student3)</i>
	Merriam-Webster	<i>"I use Merriam-Webster to check whether the vocabulary I use is appropriate for the context. Sometimes I use Merriam-Webster to find word thesaurus." (Student16)</i>
	DeepL	<i>"DeepL is used to translate vocabulary or sentences from Indonesian to English, and vice versa." (Student5)</i>
	U-Dictionary	<i>"It helps my academic writing to be more fluent." (Student36)</i>
	Dictionary.com	<i>"It helps me to recheck proper word usage in my academic writing." (Student20)</i>
	Turnitin	<i>"Turnitin helps me to know what percentage of plagiarism in my writing." (Student46)</i>
Sources	Google Scholar	<i>"Google Scholar to find journals and all references." (Student4)</i>
	ChatGPT	<i>"Its function is to find the references needed, and using AI is more efficient." (Student47)</i>
Saving Track	Microsoft Word	<i>"To facilitate academic writing." (Student25)</i>
	Google Docs	<i>"Google Docs is used to write and save drafts automatically." (Student62)</i>

References	Mendeley	<i>"Mendeley to cite references both in-text and in the reference list." (Student31)</i>
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According to the table, students could use four different functions of technology tools in English academic writing. The first category was language tools, which focus on language structure, vocabulary choices, dictionaries, paraphrasing, avoiding plagiarism, cohesive, and coherence. It consisted of Grammarly, QuillBot, Smolin, Paraphraser.io, Google Translate, Merriam-Webster, DeepL, U-Dictionary, Dictionary.com, and Turnitin. The second category was sourced, which is the place for students to explore the ideas or supporting references to use in English academic writing. It consisted of Google Scholar and ChatGPT. The third category was saving track, which means those technology tools could help students save their writing progress in online and offline storage. It consisted of Microsoft Word and Google Docs. The fourth category consist of Mendeley which students could save journal or book as sources in their writing and make easy to cite in-text of the writing.

Students perceived AI and technology in students' English academic writing

Using AI and technology in English academic writing provides many benefits for students to enhance their writing. The AI and technology could properly drive students in English academic writing to find sources and finalize the paper. It stated that

"There are many benefits that can be obtained in using media technology for English academic writing, and the media can help in finding references, paraphrasing, checking language structures, and checking plagiarism." (Student4)

In addition, students felt that implementing AI and technology in English academic writing allows them to deliver their writing ideas better. It stated,

"The benefits that I can feel were mainly making my writing more effective and efficient to read, the word selection and sentence structure were good, and the meaning I mean is conveyed more clearly." (Student7)

The use of AI and technology in English academic writing presents a convenient way to create a writing product that influences students' writing skills. Students used several technology tools in different writing stage, it mentioned that

"I write the idea in my word first, then I used Grammarly and correct the wrong grammar." (Student55)

According to students' experience, the availability of AI and technology is helpful for appropriately directing them in English academic writing. It stated that

"This technology is used for academic purposes which helps students in writing English independently because there is no direct mentor to help/give feedback/correct." (Student10)

In addition, students experience many improvements in the duration, few mistakes, suitable vocabulary usage, increased vocabulary knowledge, and lower plagiarism by utilizing the AI and technology in English academic writing. It mentioned that

" I experienced significant improvements, such as the duration of the assignment being relatively faster, reducing grammatical errors in the assignment, the use of vocabulary being more appropriate to the context, increased vocabulary knowledge, and can reduce the percentage of plagiarism using Turnitin." (Student16)

Discussion

English language students are familiar with AI and technology to write academic papers, proven through various tools to help them in the writing process. Most technology applications related to Artificial Intelligence (AI) promote students in English academic writing by providing efficiency, quality, and availability (Burkhard 2022). The study by Chen (2023) indicated that AI had revolutionized the academic writing process by presenting accurate and readable results. Using AI presents a writing product that potentially increases writing quality (Cardon et al. 2023). The researcher categorized the AI and technology into four types, namely, language tools, sources, saving tracks, and references. In line with Scholnik (2018), who discovered AI and technology to support students in academic writing, the writers could utilize some tools at once to reach the goals. The tech-assisted media support that contains AI-based could facilitate the writer with an automatic writing process for editing or finalizing (Adams and Chuah 2023).

In this study, the finding showed that the most frequent tools of AI and technology are Grammarly and QuillBot. It is in line with Adams and Chuah (2023) suggested that language checkers for facilitating writing. The study in Afghanistan showed that most English students used Grammarly in academic writing since it became convenient (Yousofi 2022). In Indonesia, implementing Grammarly could positively impact construction students' English academic writing products (Faisal and Carabella 2023). The other popular tool is QuillBot, and many students use this media to paraphrase their writing. QuillBot help students recreate their English writing without replacing the real meaning and accelerate the writing process (Nurmayanti and Suryadi 2023). Students at the post-graduate level experience the easiness of using QuillBot in improving their English academic writing quality (Kurniati and Fithriani 2022). At the same time, the most current popular tool used by students in their English academic writing is ChatGPT which is part of AI-based technology tools.

The other interesting findings indicated that students used several technology tools in one time for English academic writing. Students who use Grammarly expect it to influence their language structure since an AI-based tool could directly perform to give corrections (Rahman et al. 2022). In line with Fitriana and Nurazni (2022), using Grammarly has positively impacted their English academic writing by motivating them to understand grammar. In addition, students use paraphrasing tools to generate new ideas in writing. The study by Kurniati and Fithriani (2022) indicated that using QuillBot promotes students' language development, influencing their English academic writing. Besides, students could employ translation machines to discover appropriate vocabulary. Tsai (2020) emphasized that students' writing improved by implementing Google Translate, which showed advanced word choices. The AI-based technology facilitates students to develop their English academic writing. Students could employ technology tools to enhance their writing skills (Jia et al. 2022).

In addition, by integrating AI and technology, students get many beneficial things such as they can elaborate their ideas using the media tools. It is supported by Nurmayanti and

Suryadi (2023), who mentioned that instead of duplicating other English academic writing, students could use the tools to create their ideas to get writing novelty. The study in China discovered that technology tools become a need of media to help English students in writing correctly and promoting students' performance (Tsai 2020). Besides, technology could drive to create a masterpiece of English academic writing. Generating ideas to write accurately becomes a challenge; thus, AI-based technology tools facilitate students to explore their writing skills (Cardon et al. 2023). In line, Alotaibi and Alzu'bi (2022) emphasized that students who write by implementing available writing software have opportunities to produce English academic writing properly. AI and technology in English academic writing can contribute to students' writing by providing sophisticated writing features (Alhusban 2016).

The other findings showed that the duration in using technology tools could influence students' English academic writing quality. Prolonged exposure to technology tools has brought about noticeable changes in writing habits and styles (Farrokhnia et al. 2023). Extended engagement with technology tools often leads individuals to adopt a more informal and abbreviated writing style. It is supported by Nabhan (2017) that using sophisticated technology for English academic writing could have negative impacts, such as malfunction and inaccuracy in writing results. Besides, studies have indicated a decline in writing skills among students heavily reliant on technology, and it could be seen in decreasing creativity and critical thinking (Colbert, Yee, and George 2016; Farrokhnia et al. 2023). Excessive technology use has been associated with increased reliance on auto-correct and spell-check tools and a decline in the ability to construct well-organized writing (Koltovskaia 2020). Thus, this study implies that students need to balance using the convenience of media and their writing skills.

In addition, the findings showed that students got many opportunities to learn more in English academic writing by using AI and technology. Students unconsciously could understand their lack of English academic writing after using the tools repeatedly. Nazari et al. (2021) emphasize that technology tools become useful as writing assistants to direct students' behavior in recognizing their errors or mistakes. The handiness of AI and technology in English academic writing could motivate to write accurately and substantially by presenting positive experiences (Kurniati and Fithriani 2022). Also, students could improve their English academic writing. The study by Lee (2019) discovered that students could properly acknowledge many things, from vocabulary, grammar, and translation, using AI and technology. There are valuable improvements in accuracy and less error by utilizing technology tools to support students' writing results (Ghahri, Hashamdar, and Mohamadi 2015). The study by Jia et al. (2022) showed that there are AI-Enabled Language Learning for students' acquisition of language structure and vocabulary also provide students to monitor their English writing.

Furthermore, students claimed that they experienced improvement in their English academic writing by utilizing AI and technology. Since students thought their English proficiency could not achieve a native level, technology tools assist in improving their writing. The study by Lee (2019) indicates that students could prepare their writing ability based on strategies and processes to accomplish English academic writing perfectly through technology tools. In line, Hakiki (2021) mentioned that English students get a positive impact in improving writing skills by using Grammarly to enhance academic writing. Besides, students acquire vocabulary enhancement by implementing technology tools since it provides direct feedback, leading to cognitive comprehension (Setyani et al. 2023). In addition, students get a positive influence on their writing performance. Similarly, Jia et al. (2022) found that AI-based

technology encourages students writing skills by understanding the context and increasing students' motivation. The way students use AI and technology would reflect their writing (Chaudhry et al. 2023), particularly in English academic writing.

Analysis

This study used qualitative research followed the design by Miles et al. (2014). It is divided into three basic steps of data analysis: data condensation, display, and conclusion. The researcher went through each step of the process from gathering raw data to presenting conclusions on concerns related to AI and technology in students' English academic writing.

In order to analyze the data from open-ended questionnaires, multiple stages have to be completed. The questionnaire results were taken from Google Form as an Excel file. First, the researcher analyzed the findings and marked them based on the themes of the questionnaires. Following that, the researcher chose similar, appropriate, or distinct answers to report findings based on the research questions. Second, in the data display, the researcher showed the results of the questionnaires in the form of a chart with a list of tools and a narrative form based on the students' perspectives. The researcher next analyzed each category in order to address the research questions using various ideas. In addition, the open-ended questionnaire data result was explained more thoroughly in the discussion section by incorporating other studies.

The researcher used various stages when analyzing semi-structured interview data. First, the researcher converted the voice data into written documentation. Every meaning of a speech was interpreted by the researcher to make it easier to comprehend. Following that, the researcher chose relevant data from semi-structured interviews to respond to the research questions. Second, in the data display, the findings of semi-structured interviews were presented in the result section in narrative form. The interview data was displayed in both Bahasa Indonesia and English. The researcher then used theories to examine the data from semi-structured interviews. In the discussion section, the results of semi-structured interviews were reviewed in further depth. The researcher completed the interview results and discussion in the conclusion section.

Conclusion

The advancement of AI and technology offers the easiness for students to explore technology tools to support the English academic writing process and increase writing skills. According to the result, there are 15 technology tools students use to assist their English academic writing. It is divided into four categories of AI and technology used by English students at the undergraduate level, and it consists of language tools, sources, saving tracks, and references. There are different functions of each technology tool that can utilize by students in creating English academic writing. The most popular are Grammarly and QuillBot, AI-based technology tools that provide automated feedback, correction, and suggestions. In addition, students' experience in implementing technology for English academic writing faces different practices, and they got an improvement for writing assistance and continuity to use in the future. Students' improvement directs their English academic writing by producing better writing quality and improving language proficiency. Students are furnished with various AI and technology that could help them English academic writing faster and more accurately. However, it becomes necessary to integrate technology tools and actual students' writing

ability in delivering the ideas. Tools are merely for assisting, giving convenience, and learning new insight for expanding English academic writing. Utilizing AI and technology could enhance students' English academic writing skills by offering many benefits that could direct students to recognize their writing progress. Students who face difficulties in grammar, spelling, word choices, and others could use technology tools to improve their writing quality and practice their writing to get reputable English academic writing. The AI and technology give opportunities for students to enhance self-awareness, self-learning, and self-confidence in creating masterpieces of English academic writing that could be useful for society.

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