A Mixed-Method Study on the Effectiveness of Using ChatGPT in Academic Writing and Students' Perceived Experiences

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ABSTRACT

Introduction: The advent of artificial intelligence in education has brought forward tools like ChatGPT, which can potentially enhance students' academic writing abilities. However, there is limited empirical evidence examining its effectiveness and students' perceptions of its utility in academic contexts.

Purpose: This study aimed to measure the effect of using ChatGPT on students' academic writing abilities and to investigate students' perceived experiences regarding the use of ChatGPT in their writing process.

Method: An explanatory mixed-method design was employed, incorporating a quantitative experiment followed by a qualitative investigation. The quantitative phase involved 102 fifth-semester students from an English education department at a university in Indonesia. These students were randomized into clusters based on their proximate writing test scores, resulting in two homogenous classes of 25 students each. These classes were then assigned to either an experimental group, which received 14 sessions using ChatGPT as a learning tool for academic writing, or a control group, which received 14 sessions using non-generative tools. Pre-tests and post-tests were administered to both groups. The qualitative phase involved interviews with 10 selected students from the experimental group to explore their perceived experiences with ChatGPT.

Results: The pre-test scores indicated homogeneity between the experimental and control groups, with scores of 57.15 and 56.35 respectively. After the intervention, the post-test scores revealed significant improvement in the experimental group, with an average score of 81.11 compared to 60.30 in the control group. Statistical analysis demonstrated a significant disparity between the two groups (p-value = 0.0000 < 0.05 for the experimental group and p-value = 0.067 > 0.05 for the control group), suggesting that the use of ChatGPT significantly enhanced students' academic writing abilities. The qualitative findings supported these results, with students reporting that ChatGPT facilitated idea generation, organization, and construction in their writing process.

Conclusion: The study concludes that ChatGPT significantly improves students' academic writing abilities, as evidenced by both quantitative and qualitative data. The tool's capacity to assist in the formulation and organization of ideas presents substantial potential for its use in academic research and writing. Given these findings, ChatGPT could be a valuable addition to the educational toolkit for enhancing academic writing skills.

KEYWORD

academic writing, AI, chatgpt, writing performance

INTRODUCTION

The objective of academic writing is to effectively convey research results within a specific scientific discipline. Academic writing entails the anecdotal representation of research findings within a scientific field. Altunkaya & Ayranci (2020) elucidated that the aim of academic writing is to share or describe a result of research and convey information to individuals related to the research field. Writing in academic setting is a genre employed by those who demonstrate the capacity to offer perceptive observations within the boundaries of a certain area of academic inquiry, utilizing a range of concepts and theories. Before commencing the writing process, academic writers must establish a thesis. In addition, they need to possess a substantial level of expertise in the subject matter of their thesis, demonstrate familiarity with previous studies conducted in the field, and ensure that their writing is grounded in scientific principles.

The present study defines academic writing as the use of English to document scientific knowledge, communicate research methods, summarize research consequences, and present research results. Therefore, students of English as a foreign language (EFL) encounter difficulties in generating academic writing as a result of the substantial influence of their insufficient linguistic proficiency on their writing aptitude. One plausible determinant that may contribute to this phenomenon is the extensive implementation of examination-focused pedagogy and acquisition in the field of EFL.

Despite the myriad benefits that writing programs afford to college students, the attainment of writing proficiency has grown progressively challenging for them. This phenomenon has been documented in various contexts worldwide. Even among committed students, a plethora of writing deficiencies persists, spanning areas such as text organization, grammatical accuracy, mechanical precision, and lexical competence (Toba & Noor, 2019). In light of this issue, several educators are endeavouring to discover a novel approach to enhance students' proficiency in academic writing. In today's digital age, the majority of activities rely on various forms of technology. Therefore, educators must actively interact with technology throughout the process of teaching and learning. Technology may serve as a medium for educators to instruct students (Apriani et al., 2021). Subsequently, Apriani et al. (2022) asserted that technology is inherently suitable for all dimensions of education, encompassing curriculum design, pedagogical strategies, instructional methodologies, media integration, content dissemination, and assessment. Utilized as an educational instrument, technology is poised to stimulate and involve students, fostering their active participation in learning (Amalia et al., 2024). The integration of technology yields a twofold impact, augmenting students' scholastic achievements while concurrently moulding their personal attributes for future success. As technological advancements continue to unfold, educators experience a compelling obligation to leverage technology as a conduit for enhancing students' competencies. This research endeavours to ascertain the efficacy of ChatGPT, integrated within a technological framework, in enhancing students' proficiency in academic writing.

ChatGPT, introduced in November 2022, has swiftly become a prominent figure in academic discourse, thanks to its multifaceted capabilities, ranging from extensive expositions to succinct anecdotes and even poetic expressions (Dergaa et al., 2023). Its success is evident in the staggering number of active users, exceeding 100 million by January 2023, thus solidifying its position as a favoured tool within the OpenAI community (Al Yakin et al., 2023). At the heart of ChatGPT lies the Generative Pertained Transformer (GPT) technology, which has revolutionized conventional learning and writing methodologies by its intricate design and complexity (Kirmani, 2023). Recent advancements by OpenAI, particularly with ChatGPT-3.5 and ChatGPT-4, have facilitated the integration of conversational chatbots for educational purposes, significantly enhancing convenience (Taecharungroj, 2023). The evolution of writing tools and programs has undergone a significant transformation, showcasing the latest ChatGPT iterations that demonstrate exceptional efficacy in generating textual contents. This is particularly notable in the context of lengthy essays and creative writing assignments, where ChatGPT exhibits remarkable performance (Rasul et al., 2023).

ChatGPT's capabilities extend beyond writing tasks to encompass a broad spectrum of functionalities, including responding to questions, coding, and facilitating group discussions on various topics (Lund & Wang, 2023). Leveraging its streamlined architecture and extensive data repositories, ChatGPT comprehends user queries and delivers relevant responses while maintaining contextual coherence. Its versatility as a writing tool is underscored by its ability to generate ideas, assist in editing, and proofread written content effectively (Sallam, 2023). Regarding usability and accessibility, ChatGPT presents a range of versatile features encompassing communication tools, writing aids, and search functionalities. These capabilities hold the promise of revolutionizing traditional pedagogical approaches and enriching personalized learning journeys (Firat, 2023). Despite its capabilities, ChatGPT is viewed as an aid rather than a replacement for human writing, emphasizing the irreplaceable role of genuine authors (Lund et al., 2023).

While certain scholars recognize ChatGPT as a valuable writing instrument and even incorporate it as a co-author in scholarly works, there are cautious voices within academia. They point out the infrequent acknowledgment of ChatGPT in academic literature, raising concerns about its scholarly acceptance (Kung et al., 2023; Manohar & Prasad, 2023; Stokel-Walker, 2022; Thorp, 2023). Nonetheless, the evolution of academic and scientific writing methodologies due to AI tools and technology is undeniable, yet it is crucial to recognize that complete displacement of human-authored text

by AI-generated content is unlikely, signifying ChatGPT's role as an assistant rather than a substitute for human writers.

In this situation, the researchers used ChatGPT 3.5 to find out if ChatGPT had an effect on students' academic writing abilities. The researchers conducted this research on fifth-semester students in the English department at a higher educational institution in Indonesia in the 2023–2024 academic year. In the current semester, students encountered many challenges in English academic writing. In the preceding context, the integration of AI or ChatGPT was non-existent in the pedagogical landscape, encompassing both students and educators. The researchers conducted preliminary research involving students enrolled in the English study program at IAIN Curup. Based on the findings, the students still have a lot of trouble organizing their thoughts in a way that allows them to generate high-quality writing while they make their academic writing from chapter one until the end. The students were honest about their situation and admitted that they were unable to investigate their ideas right away. Because of this reasoning, the researchers chose to carry out this research to discover whether ChatGPT is effective in boosting students' English academic writing abilities.

Prior research has been conducted on the utilization of ChatGPT for instructing essay writing. Burkhard (2022) conducted initial research, titled "Student perceptions of AI-powered writing tools: Towards individualized teaching strategies." The findings showed that students' opinions on AI-driven writing tools significantly differed. Certain students may utilize them in an unquestioning manner, leading to unintentional plagiarism. Furthermore, Shidiq (2023) conducted a study titled "The use of artificial intelligence-based Chat-GPT and its challenges for the world of education: From the viewpoint of the development of creative writing skills." The results indicate that the simplicity with which ChatGPT processes text input restricts the level of originality in its output, resulting in a tendency towards a lack of creativity. The utilization of the Chat-GPT system for the purpose of creative writing is notably seamless owing to its proficiency in comprehending natural human language. This domain encompasses the generation of literary compositions that exhibit a standard of excellence comparable to those created by humans, spanning across genres such as poetry, short fiction, novels, and various forms of written expression.

The aforesaid studies have contributed to providing insights regarding the use of ChatGPT in writing and in the other context of teaching and learning. However, thus far, limited research has been conducted on testing the effectiveness of ChatGPT especially in the context of academic writing. Hence, this study is sought to fulfil this void. This study is oriented towards two purposes: (1) to examine the effect of ChatGPT on students' academic writing abilities, and (2) to investigate students' perceived experiences after using ChatGPT in learning academic writing.

LITERATURE REVIEW

Definition of Academic Writing

Academic writing is referred to as a way or a skill for utilizing English to record scientific knowledge, explain how research is conducted, describe how it is completed, and detail its ramifications. A scientific field's research findings are objectively described in academic writing. Academic writing serves the purpose of disseminating the findings and insights derived from recent research endeavours to the scholarly community, with its primary readership comprising individuals engaged in the pertinent field of study (Altunkaya & Ayranci, 2020). It represents a specialized genre employed by scholars capable of engaging in discourse within the framework of a specific discipline, drawing upon diverse theoretical frameworks and perspectives. Prior to commencing the writing process, academic authors are required to formulate a clear and coherent thesis statement as a foundational element. They also need to have a good understanding of and an appreciation for prior research in the field of interest of their thesis, as well as a solid scientific foundation for their writing.

In academic writing, various models have been proposed to enhance our understanding of student writing and literacy. One such framework is presented by Yu and Liu (2021), who identify three distinct models: socialization, academic literacy, and study skills. The study skills model emphasizes mastery of the technical aspects of academic writing, focusing on surface-level elements such as grammar, syntax, punctuation, and orthography. This model assumes that proficiency in these areas is crucial for effective academic communication. In contrast, the academic socialization model, often referred to as the second paradigm, suggests that proficiency in academic writing is achieved through familiarity with the conventions of specific academic discourses. This approach underscores the importance of understanding and adhering to the norms and expectations of academic communities. Finally, Yu and Liu (2021) discuss the academic literacies model, which views student writing not merely as a technical skill but as a process of meaning-making and knowledge creation. This model is primarily concerned with the deeper understanding of concepts and the generation of new ideas within the academic context.

Artificial Intelligence in ELT

Machine intelligence, commonly referred to as «artificial intelligence,» encompasses a range of abilities that demonstrate the capacity of machines to perform tasks that typically require human intelligence. These abilities include voice recognition, planning, learning, and problem solving. According to McCarthy (2022), artificial intelligence represents the degree of intelligence exhibited by machines, enabling

them to mimic or replicate cognitive functions associated with human thought processes.

The integration of technology in language acquisition and pedagogy has garnered increased attention over the past three years, particularly with regard to advancements in artificial intelligence (AI) (La'biran et al., 2023; Taufik et al., 2021). There are still issues with AI in education, such as output bias, misuse, and human oversight. When handled properly, these issues can offer teachers new insights and chances to introduce students to the societal tendencies, concerns, and risks that come with AI applications. In an ethically sound way, Kasneci et al. (2023) use these models to clarify and offer answers for these problems.

In the near future, artificial intelligence (AI) possesses the capacity to profoundly reshape the landscape of education and revolutionize the operational paradigms of educational institutions. Gocen and Aydemir (2020) qualitatively investigate the viewpoints of participants from various organisations regarding the use of AI. Along with new advantages, the incorporation of AI within educational settings yields a spectrum of impacts, encompassing both advantageous and detrimental effects on educational institutions and educators alike. Positive impacts of AI in education include its ability to tailor content to individual learner's pace, efficiently determine learner needs, and save time and resources through automated processes (Apriani, Arsyad, et al., 2022; Utami et al., 2021). Additionally, AI can facilitate fast data analysis, leading to better decision-making and the ability to predict population movements for targeted investments. However, there are also negative impacts associated with AI in education. Over-reliance on AI may encourage a mechanical approach to learning, potentially overshadowing intuitive knowledge and humanistic values that are integral to education. Ethical concerns arise as well, including the potential for full student evaluation through AI systems, categorization based on IQ or other metrics, and a reduced need for human intervention in the educational process, which can impact the quality of education and the development of critical thinking skills. The results offer guidance on the utilization of AI and strategies for managing potential challenges. Despite the prevailing sentiment of enjoyment among the majority of participants, concerns were raised regarding the potential implications of AI for educators and other scholars in the forthcoming years (Maharrani et al., 2023).

AI within the framework of English as a Foreign Language (EFL) learning has yielded favourable outcomes in the domain of English language acquisition. Diverse AI applications, including Automated Evaluation Systems, Neural Machine Translation Tools, Smart Tutoring Systems, AI Chatbots, Intelligent Virtual Environments, and Affective Computing, have augmented the efficacy and efficiency of EFL learning processes. AI can help reinforce language compre-hension, oral communication skills, listening, reading, and argumentative writing in English. Furthermore, integrating Affective Computing into Smart Tutoring Systems can aid in identifying and classifying learners' emotions, providing appropriate emotional support to motivate EFL learning (Jiang, 2022). Nevertheless, additional investigation is warranted to delve into the pedagogical capabilities of AI in mitigating diverse challenges encountered in EFL instruction. Furthermore, a comprehensive understanding of the ethical considerations and potential risks entailed in the integration of AI within the EFL milieu necessitates further scholarly inquiry.

The use of AI in EFL and writing contexts introduces a variety of challenges that educators and learners must navigate. In their study, Song and Song (2023) delineated several of these challenges. One challenge is related to user satisfaction levels, as not all users may be content with the feedback provided by AI systems, given variations in user preferences and expectations. Another challenge lies in the limitations of AI in offering comprehensive feedback, which may hinder deep understanding of mistakes. Moreover, there exists a potential hazard of technological dependency, wherein individuals may excessively lean on AI tools for self-assessment and enhancement, potentially diminishing their capacity for autonomous learning. Adapting AI to individual needs is also a challenge, considering the diverse learning styles and requirements of learners. Furthermore, AI may struggle with understanding cultural and linguistic nuances that affect writing, limiting its ability to provide truly relevant feedback. Encouraging creativity in writing is another hurdle, as AI's focus on technical aspects like grammar might overshadow the development of creative writing skills. Addressing these challenges necessitates a comprehensive strategy that amalgamates AI with conventional pedagogical approaches, aiming to optimize its advantages in augmenting writing proficiency and fostering motivation for learning within EFL environments.

Addressing the challenges associated with the use of AI in educational contexts requires a multifaceted approach. Hsiao and Chang (2023) explained that one crucial solution is the development of AI systems capable of providing more comprehensive and contextual feedback. Additionally, AI should be designed to adapt to individual needs, offering tailored feedback while avoiding the risk of fostering excessive dependence. Integrating AI with traditional teaching methods is also vital, as it can optimize the benefits of technology while preserving students' evaluative and creative writing skills. Furthermore, user training and education are essential to ensure that AI technology is utilized effectively and without over-reliance. Finally, enhancing AI's sensitivity to cultural and linguistic contexts within the EFL domain can significantly improve the relevance and meaningfulness of the feedback provided.

Academic Integrity and Ethics in the Context of Generative AI

The integration of generative AI tools, such as ChatGPT, into educational settings has opened up significant opportunities while simultaneously raising critical questions regarding academic integrity and ethics. These advanced AI systems can assist students in generating ideas, organizing content, and improving their writing. However, the ease and efficiency they provide also pose substantial challenges that must be addressed to maintain the integrity of academic work. Generative AI tools have the potential to enhance the learning experience by providing students with immediate feedback and suggestions for improvement. According to AlAfnan et al. (2023), ChatGPT can significantly improve students' writing skills by acting as a supplementary educational tool. However, this potential comes with a responsibility to ensure that the technology is used ethically. The authors highlight the need for clear guidelines and monitoring to prevent misuse and uphold academic standards.

One of the primary concerns associated with the use of AI in education is the issue of originality and authorship. Fyfe (2022) discusses how AI can facilitate the completion of assignments but also warns of the ethical dilemmas it creates. The ability of AI to generate text that appears original can lead to instances of plagiarism and reduce the incentive for students to develop their writing skills independently. This concern is echoed by Fuchs (2023), who points out that while AI tools like ChatGPT can support learning, they can also lead to over-reliance, thereby compromising the authenticity of students' work.

The global landscape of AI ethics guidelines provides a broad perspective on the ethical considerations of AI use. Jobin et al. (2019) examined various AI ethics guidelines worldwide and noted the importance of context-specific approaches. These guidelines emphasize the need for educational institutions to develop policies that address the unique challenges posed by AI in academic settings. The harmonization of these guidelines at a global level could help mitigate the ethical risks associated with AI. Moreover, the local context plays a crucial role in how AI ethics are applied and understood. Vetter et al. (2024) propose a framework for local interrogation of AI ethics, focusing on text generators like ChatGPT. Their study highlights the necessity of adapting ethical guidelines to fit local educational contexts to address specific ethical issues effectively. This localized approach ensures that the ethical implications of AI use are considered within the cultural and institutional frameworks of each educational setting.

While generative AI tools offer significant benefits for educational enhancement, their integration into academic environments must be managed with a keen awareness of ethical considerations. Institutions must develop and implement robust guidelines that ensure the responsible use of AI, promoting academic integrity and preventing misuse. By addressing both global and local ethical concerns, educational institutions can harness the potential of AI while safeguarding the principles of originality and ethical authorship in academic work.

ChatGPT 3.5

The ChatGPT 3.5 software employs generative language models to anticipate the subsequent words or phrases following a given sentence or written prompt. In essence, ChatGPT is an artificial intelligence program designed to emulate human-like conversations while functioning as a virtual robot. This prototype AI chatbot is designed to automatically reply to real human language via discussion. Due to its ability to provide resolutions for all problems, this platform is considered capable of assuming the function of Google. ChatGPT by Open AI is capable of delivering comprehensive answers to complex queries. Compared to other chatbots, ChatGPT has a significantly elevated degree of intelligence. ChatGPT exemplifies the Instruct GPT model crafted by OpenAI, engineered to promptly interpret and comply with directives while furnishing detailed and comprehensive responses (Joyce, 2023). Open AI's ChatGPT can assimilate feedback and adapt its behaviour by retaining information from past interactions. Chatbots have been the focus of many previous inquiries.

ChatGPT currently possesses the capability to assist researchers in many tasks, such as composing articles and abstracts, conducting literature research, condensing data or material, offering recommendations for structure, references, and titles, enhancing the readability of texts during language evaluations, and even generating complete drafts of papers (Hutson, 2022). It was also delivered by M. M. Rahman et al. (2023) that ChatGPT offers numerous benefits to researchers in terms of generating new ideas, defining research topics, and even composing abstracts using prompts. Furthermore, the researchers suggest that academic scholars could employ this method to condense extensive text and ascertain crucial discoveries from the literature. ChatGPT possesses the ability to produce textual content encompassing a vast array of subjects. ChatGPT recently composed a comprehensive letter to the editor in response to the author's inquiries (King, 2023). Artificial intelligence cannot generate novel ideas, but it is capable of arranging and refining the ideas provided by the researchers, resulting in an early version. Nevertheless, the current state of the generated text is merely a foundation for human-driven text creation, as it falls significantly short of replacing the expertise, ingenuity, and analytical skills of human specialists. Yan (2023) stated that ChatGPT is a useful writing tool that assists in developing creative content. Researchers have recognized its promise in language acquisition and facilitating the writing process.

Teaching Academic Writing by Using ChatGPT

The application of ChatGPT in academic writing instruction is becoming increasingly prevalent. Figure 1 illustrates how ChatGPT can be utilized as a tool to assist students in developing their academic writing skills, providing guidance on language use, structure, and idea generation.

To cope with their manifold academic responsibilities, scholars, researchers, and students have traditionally employed Large Language Models (LLMs) like ChatGPT. According to Gordijn and Have (2023), ChatGPT does not suffice the maturity as a competent researcher before it can create a thorough scientific paper. Nevertheless, it is expected that the functionalities and uses of ChatGPT will expand much more, including activities like creating experiments, writing and finishing papers, performing peer review, and making editorial choices (Van Dis et al., 2023). The ChatGPT system has the ability to engage in communication and interaction with textual content in several languages, hence facilitating the effective dissemination of information. Furthermore, it can aid individuals lacking proficiency in English to effectively generate and comprehend academic works (Liebrenz et al., 2023).

ChatGPT has demonstrated significant versatility in performing a wide range of functions, making it a valuable tool in various contexts. This AI system is capable of tasks such as textual composition, answering queries, coding, and providing both individual and collective guidance to enhance productivity. According to Lund and Wang (2023), these objectives are achieved through ChatGPT's efficient design and its access to extensive data repositories, which enable it to comprehend and process user input effectively. By analyzing the instructions given through user inquiries, ChatGPT is able to generate relevant and accurate responses. Moreover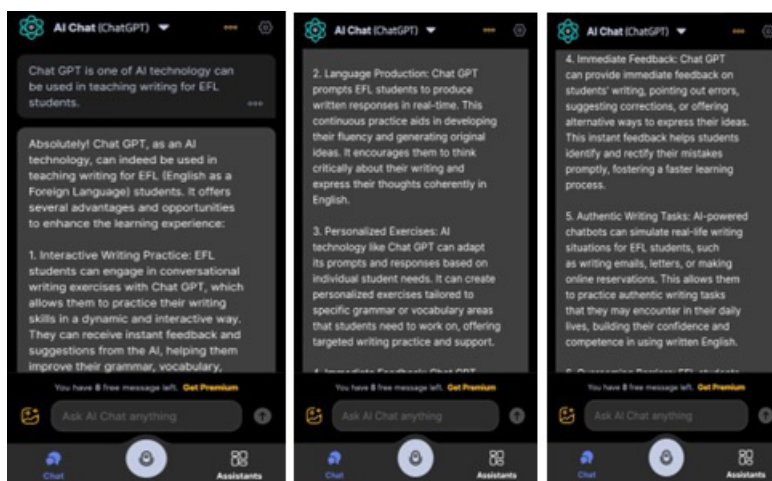, it is designed to handle requests by either approving or declining them, answering questions, retaining the context of previous interactions, and adjusting in subsequent interactions as needed. This adaptability allows ChatGPT to provide consistent and contextually aware assistance across different tasks.

ChatGPT can be a very important tool for providing writing support and completing writing tasks in a variety of ways, according to academic and scientific talks conducted worldwide (Sallam, 2023). According to research that has been done on the topic, ChatGPT serves as a comprehensive solution for writing activities, from idea generation through final editing and proofreading. The development of ChatGPT has significantly enhanced the efficiency of the writing process. This tool has the capability to expedite content creation, requiring less time and effort from students and teachers alike. With ChatGPT's ability to provide well-structured and logical material on any given topic, individuals can redirect their focus towards other aspects of their work, leading to increased productivity and time-saving benefits (Lund et al., 2023; Yan, 2023). Furthermore, ChatGPT plays a pivotal role in idea generation for writing projects. Researchers such as (Kasneci et al., 2023; Taecharungroj, 2023) have highlighted its potential in assisting students to come up with innovative ideas. By suggesting subjects, concepts, and perspectives that may not have been previously considered, ChatGPT stimulates creativity and supports students in expanding their writing horizons.

In addition to idea generation, ChatGPT offers valuable assistance in text translation across languages. This feature is particularly advantageous for students writing papers in languages other than their native tongue. By ensuring accurate and complete translations, ChatGPT enables students to maintain the integrity and precision of their work, contributing to higher quality outputs (Lund & Wang, 2023). Moreover, the reliability and accuracy of content produced

Figure 1

The Use of ChatGPT for Academic Writing

with ChatGPT are notable. Its extensive informational resources enhance the likelihood of generating reliable content. This is further facilitated by ChatGPT's ability to identify and rectify errors, making the process of content creation more streamlined and efficient.

Additionally, ChatGPT fosters improved collaboration among students and teachers. Its AI-generated content facilitates effective team collaboration by allowing multiple individuals to work on a project simultaneously. Furthermore, ChatGPT's editing and proofreading capabilities, including grammatical, syntax, and spelling fixes, contribute to enhanced writing quality and reduced errors. As a result, students can write more effectively and confidently, supported by ChatGPT's collaborative features and error-correction abilities.

ChatGPT Challenges for Higher Education

While ChatGPT has many advantages to its users, it is crucial to recognize that it also has several disadvantages that require thoughtful attention throughout its use. The primary obstacle is in the matter of measuring accuracy. The system's precision is contingent upon the volume, intricacy, and calibre of the training datasets, alongside the quality of input data provided by students. Such system tends to disengage higher education learners in in-depth thinking activities. In the meantime, Fuchs (2022) explained the significance of advancing proficiency within higher education and emphasized the paramount importance of nurturing students' advanced cognitive abilities, such as problem-solving and critical thinking. Because human language is so complex, the system of ChatGPT can find it difficult to understand, which could lead to misunderstandings and incorrect responses.

Incorporating ChatGPT within higher education settings presents a notable challenge for students, as it may foster excessive reliance on technology, potentially hindering the cultivation of essential critical thinking skills (Michel-Villarreal et al., 2023). Although critical thinking is commonly acknowledged as a desirable skill, there are several additional advanced cognitive capacities that might be investigated in the context of using ChatGPT. An excessive dependence on technological tools like Google Bard and ChatGPT may result in students adopting a passive learning approach, wherein they unquestioningly accept the system's generated responses without engaging in critical evaluation or inquiry into the information's accuracy or relevance (Dempere et al., 2023). Important critical thinking abilities, such as assessing the credibility and dependability of sources, forming well-informed opinions, and generating innovative concepts, may be neglected as a result.

Moreover, an overreliance on it might promote entrenched prejudices and perpetuate inequalities in the realm of education. This occurrence would constitute a failure to con-

front and dismantle prejudiced practices within the realm of higher education. The potential consequences of training the system with incomplete or insufficient data include the generation of responses that reinforce these biases, so reinforcing pre-existing inequities (Dempere et al., 2023). To mitigate these challenges, it is imperative for educational institutions to furnish students with clear guidelines on the appropriate integration of ChatGPT as an educational tool, emphasizing its supplementary role rather than as a replacement for critical thinking and self-directed learning (Inderawati et al., 2024; Van Slyke et al., 2023). Academic institutions must prioritize providing ample opportunities for active learning to nurture the cultivation of critical thinking, problem-solving, and independent inquiry skills among students.

In a recent investigation carried out by Wilkenfeld et al. (2022), it has been found that chatbots possess distinct linguistic constraints. Coniam's (2014) study demonstrates that chatbots generally generate responses that adhere to grammatical norms. Nevertheless, ChatGPT now has a deficiency in terms of practical applicability and linguistic diversity (Chaves & Gerosa, 2022). However, Wilkenfeld et al. (2022) proposed that chatbots have the potential to progressively conform to the speech patterns of humans in certain circumstances. Considering the strides made in natural language processing and the evolution of artificial intelligence frameworks such as ChatGPT (Molnár & Szüts, 2018), it is a justifiable anticipation that the linguistic precision of ChatGPT will enhance progressively, enabling it to more closely emulate the expressive writing techniques employed by human beings (Park et al., 2021).

METHOD

Research Design

The researchers in this study employed a mixed-method design, namely explanatory sequential research, to effectively handle data in both quantitative and qualitative formats. A study by Creswell and Clark (2017) indicated that employing mixed methods in the educational technology domain enables researchers to comprehensively analyse the impact of a new tool, namely, ChatGPT in the present study's context, from both instructional and student perspectives. The researchers sought to 1) find out the effect of using ChatGPT 3.5 on students' academic writing abilities and 2) investigate their perceived experiences after using ChatGPT in learning academic writing. The effect of using ChatGPT was examined quantitatively by using an experimental study. The investigation of students' perceived experiences of using ChatGPT was undertaken qualitatively. This qualitative part is crucial to generate vicarious experiences valuable for readers or other researchers who had interests in AI research.

Participants

The study's participants comprised 102 fifth-semester students enrolled in an English academic writing course within the English department of a tertiary education institution in Indonesia. They were the students from 4 classes. For the purpose of experimentation, this study employed a cluster random sampling technique to elicit two homogenous classes of students to be the participants or samples. The randomization process was based on the students' homogeneity profiles regarding their ages, educational backgrounds, workload, and proficiency in academic writing. Across the four classes, there was a noticeable homogeneity observed in terms of age distribution, educational attainment, and academic workload. However, in terms of the profile of academic writing abilities, the researchers navigated students' previous scores of academic writing exams. As a result, the researchers could find two classes of students whose means of previous academic writing exams were the most slightly proximate to one another. They were the students of Classes B and C. Each class had 25 students. With their homogenous profiles, the students of the two classes were stated to be the experimental class and the control class.

Treatments

In this research, 14 treatments were administered to the experimental and control groups to explore the efficacy of using ChatGPT versus traditional manual strategies in the academic writing process. The experimental group utilized ChatGPT for idea generation, while the control group employed manual writing strategies. Each session was carefully structured to align with the elements of a condensed undergraduate thesis, akin to a journal article, encompassing the research introduction, literature review, methodology, results, discussion, conclusion, abstract, and references. Additional digital research tools such as Google Scholar, Mendeley, and Zotero were also provided to both groups to support and enhance their research processes beyond the initial phase of idea generation.

In the experimental group, the first session introduced students to the capabilities of ChatGPT, emphasizing its potential to generate creative ideas and aid in the various stages of academic writing. Following sessions leveraged this AI tool for brainstorming topics, developing research questions, formulating hypotheses, and constructing the structural backbone of the thesis. A notable innovation was the use of ChatGPT to simulate data collection scenarios and assist in analysing data, which provided unique insights that might not surface through traditional methods (See Tabel 1). It is worth noting that ChatGPT 3.5 was the version used in this study. This detail is crucial for understanding the capabilities and limitations of the AI tool employed during the experiment. ChatGPT 3.5 offers advanced natural language processing capabilities that can assist students in generating ideas, organizing their thoughts, and improving their writing. However, it is also important to recognize that different versions of ChatGPT may have varying levels of effectiveness and potential issues. By specifying the version used, the study provides clarity on the technological context and allows future researchers to compare results across different versions of ChatGPT. This information can also help educators and policymakers understand the specific features and limitations of the tool used in the study, facilitating more informed decisions about its integration into educational practices.

Contrastingly, the control group relied on traditional academic writing techniques. This approach began with a session on manual brainstorming methods and progressed through individual research question development and hypothesis generation based on existing data or theories. These sessions aimed to deepen students' understanding of manual research processes from literature searching to method design and data analysis. The focus was on nurturing a collaborative and reflective atmosphere through group discussions, peer reviews, and mentor-led sessions (See table 1).

As the course neared completion, both groups dedicated several sessions to discussing their findings, drafting conclusions, and preparing the research abstract. The ultimate session was crucial, focusing on revising the entire thesis. This involved integrating feedback from peers and instructors for the control group, and feedback from ChatGPT for the experimental group, ensuring that all thesis components were cohesively integrated and met the rigorous academic standards expected in scholarly work.

The researchers collaboratively played a role as the lecturers for both experimental and control classes in giving the research treatments. It is important to emphasize that before the treatments of each class had been provided, the students of both classes were given academic writing pretests. They received academic writing post-tests after the 14 treatments had been done.

Writing Instrument Test

This research employed a dual assessment approach to gauge the students' advancement. Specifically, the researchers administered pretests before giving treatments to both experimental and control groups and post-tests after treatments ended. Two experts of English academic writing from two universities were recruited in this study to validate the writing prompts. The outcome of the content validity assessment can serve as a tool in this study. It is important to highlight that because the test was categorized as a performance test, the researchers only relied on the content validity, and there was no construct validity and statistical

Table 1

Treatments of the Study

Ses-sion	Experimental: ChatGPT for Idea Generation	Control: Manual Writing Strategies	Other Tools	Duration (Hours)	Instructor Role (Experimental/ Control)	Student Role (Experimental/ Control)
1	Introduction to ChatGPT and initial set-up for idea generation.	Introduction workshop on traditional brainstorming strategies.	Google Scholar, Mendeley, Zotero, and others	2	Facilitator/Moderator	Active participation/Group discussion
2	Using ChatGPT for brainstorming research topics.	Group brainstorming session to determine research topics.	Google Scholar, Mendeley, Zotero, and others	2	Guide/Group discussion	Developing ideas/ Exploring topics
3	Developing research questions with ChatGPT.	Individual writing of research questions.	Google Scholar, Mendeley, Zotero, and others	2	Mentor/Advisor	Formulating questions/Independent work
4	Identifying and formulating hypotheses with ChatGPT's help.	Creating hypotheses based on existing data or theories.	Google Scholar, Mendeley, Zotero, and others	2	Facilitator/Guide	Hypothesis formation/Theory analysis
5	Writing the introduction with ideas from ChatGPT.	Manually writing the thesis introduction.	Google Scholar, Mendeley, Zotero, and others	2	Director/Director	Writing/Outline and drafting
6	Using ChatGPT to find relevant literature sources.	Manual literature search and reference organization.	Google Scholar, Mendeley, Zotero, and others	2	Information source/Advisor	Searching/Organizing references
7	Writing the literature review with structures generated by ChatGPT.	Writing the literature review using manual note-taking and outlining methods.	Google Scholar, Mendeley, Zotero, and others	2	Director/Group discussion	Writing/Drafting and editing
8	Using ChatGPT to design research methods.	Designing research methods through group discussions and note-taking.	Google Scholar, Mendeley, Zotero, and others	2	Facilitator/Group discussion	Method design/ Method design
9	Data collection simulation using scenarios created by ChatGPT.	Role-based data collection simulation: Students take on various roles in a scenario designed to understand the processes and challenges of data collection.	Google Scholar, Mendeley, Zotero, and others	2	Coordinator/Guide	Simulation/Simulation
10	Data analysis with ChatGPT's help to discover insights.	Data analysis using manual statistical techniques or software without ChatGPT's help.	Google Scholar, Mendeley, Zotero, and others	2	Advisor/Instructor	Analysis/Analysis
11	Discussing research findings using ChatGPT to gain new perspectives.	Discussing results with mentors or peers to interpret data.	Google Scholar, Mendeley, Zotero, and others	2	Moderator/Group discussion	Discussion/Discussion
12	Writing conclusions based on discussions with ChatGPT.	Writing conclusions based on results and discussions.	Google Scholar, Mendeley, Zotero, and others	2	Director/Advisor	Drafting conclusions/Drafting conclusions
13	Using ChatGPT to draft the research abstract.	Drafting the abstract based on the taught structure.	Google Scholar, Mendeley, Zotero, and others	2	Advisor/Group discussion	Writing abstract/ Writing abstract
14	Comprehensive thesis revision with feedback from ChatGPT.	Thorough thesis revision with peer-review within the class.	Google Scholar, Mendeley, Zotero, and others	2	Reviewer/Reviewer	Revision/Peer review

reliability testing as commonly done on item-based tests. In addition, the scoring of this performance test was relied on the academic writing rubric prepared by the researchers.

The pre-test and post-test were conducted over seven consecutive days for students in both the experimental and control groups, aimed at evaluating their academic writing skills. These tests were meticulously designed to assess each component of a shortened undergraduate thesis, which follows the format of a journal article. This comprehensive assessment included various segments such as the research introduction, literature review, methodology, results, discussion, conclusion, abstract, and references.

On the first day, students focused on the research introduction. They were tasked with defining the main problem, formulating research questions, and specifying the objectives of their study, producing a concise narrative between 300 and 500 words. The second day involved crafting a literature review that supported their research thesis, incorporating critical sources related to their topic, with an expected length of 500 to 700 words. The third day shifted towards the methodology section, where students detailed the procedures for data collection and analysis, including the design, population, and sampling techniques, within a 400 to 600-word limit. On the fourth day, the students presented their research findings. Since actual data collection was not feasible within the test settings, simulated data was used. They were required to present this data clearly and systematically, keeping their submissions within a 300 to 500-word limit. The fifth day was dedicated to discussing the implications of their findings, analysing how the results addressed the research questions and how they related to the existing literature, within 300 to 500 words. The sixth day involved writing the conclusion, where students summarized the research outcomes and proposed suggestions for future research or practical applications, aiming for 200 to 400 words. Finally, on the seventh day, students crafted an effective abstract that summarized all essential elements of their research and compiled a reference list according to a specified journal format, with a word count between 150 and 250 words (See Tabel 2).

Each testing session was conducted over a two-hour period, during which students used laptops to ensure uniformity in accessing and utilizing word processing features. This setup not only facilitated a consistent and efficient evaluation process but also allowed the instructor to monitor and supervise effectively, ensuring adherence to the academic standards. The use of laptops played a crucial role in maintaining the integrity of the testing environment, helping to ensure that all students had an equal opportunity to demonstrate their capabilities under standardized conditions. The identical structure of the pre-test and post-test allowed for a clear

Table 2

Prompts and Procedure of Pre- and Post-Tests

Day	Thesis Components	Test Prompts	Ideal Word Count	Duration	Tool	Lecturer Roles
1	Research Introduction	«Write a research introduction that identifies the main problem, research questions, and the objectives of your study.»	300-500 words	2 hours	Laptop	Facilitate, Supervise
2	Literature Review	«Develop a literature review that supports your research argument, including critical sources related to the research topic.»	500-700 words	2 hours	Laptop	Facilitate, Supervise
3	Research Method	«Describe the methodology you used to collect and analyse data, including the research design, population, and sampling techniques.»	400-600 words	2 hours	Laptop	Facilitate, Supervise
4	Research Findings or Results	«Present your research findings clearly and systematically, using simulated data given that actual data cannot be collected during this test session.»	300-500 words	2 hours	Laptop	Facilitate, Supervise
5	Research Discussion	«Discuss the implications of your findings, how they answer the research questions, and their relation to the existing literature.»	300-500 words	2 hours	Laptop	Facilitate, Supervise
6	Conclusion	«Write a conclusion summarizing the research results and suggestions for future research or related practices.»	200-400 words	2 hours	Laptop	Facilitate, Supervise
7	Abstract and References	«Create an effective abstract that covers all essential elements of your research and a list of references in the chosen journal format.»	150-250 words	2 hours	Laptop	Facilitate, Supervise

comparison of students' progress and the effectiveness of the instructional methods employed during the course.

When analysing the written assignments, an academic writing rubric was deployed. Two academic writing experts from two universities were recruited as the raters to evaluate students' written works using the prepared writing rubric.

From these experts, the researchers obtained data regarding the students' academic writing scores.

Interview Guidelines

A pair of experts who were experienced English lecturers from two universities in Indonesia conducted an evalua-

Table 3

Rubric of Writing Tests

Classification	Score	Criteria
Content	25-21	SUPERB TO EXCELLENT: knowledgeable, substantial, through growth of thesis, and applicable to given topic
	20-16	AVERAGE: Some understanding of the subject; a good range; some growth of the theory; mostly related to the topic but lacking information.
	15-11	MINOR TO POOR: not enough information about the subject; not enough content; not enough growth of the topic
	10-0	HIGHLY POOR: doesn't show knowledge of subject; not substantiated; not relevant; or not enough to rate
Organization	25-21	GREAT TO VERY GOOD: Fluent language, ideas stated and supported clearly; well-organized; logical order; cohesive
	20-16	GOOD TO AVERAGE: occasionally rough; not well put together, but key ideas stand out; not much support; logical but missing order of events
	15-11	FAIR TO POOR: not flowing well; ideas are jumbled or scattered; growth and ordering don't make sense;
	10-0	VERY BAD: does not speak to people, is not organised, or doesn't review enough
Grammar	25-21	GOOD TO EXCELLENT: complex designs that work well, A few problems with agreement, subject, number, word order/function, article, adjective, phrase, and word order/function
	20-16	GOOD AS A GROUP: simple but powerful builds, small problems in complicated buildings, several agreements, including tense, number, word order/function, article, pronoun, preposition, and prepositions; meaning is rarely lost
	15-11	FAIR TO POOR: big issues with easy or complicated builds, A lot of mistakes with number, negation, sentence, article, pronoun, prepositions, fragments, run-ons, delete, and word order/function, having a vague or unclear meaning
	10-0	VERY BAD: almost no understanding of how sentences are put together
Vocabulary	15-13	GREAT TO VERY GOOD: an advanced range, choosing and using the right words and idioms, mastering words, using the right range
	12-10	GOOD TO AVERAGE: a good range, sometimes mistakes with the form, choice, or usage of effective words or idioms, but the message is still clear
	9-7	FAIR TO POOR: A small area, A lot of mistakes with the form, choice, and use of effective words and idioms, Meanings that are unclear or mixed up
	6-0	VERY POOR: a translation, not enough or not enough understanding of English words, phrases, and word forms to rate
Writing Mechanics	10	VERY GOOD TO EXCELLENT: show that you know how to follow the rules, only a few spellings, grammar, punctuation, capitalization, and paragraphing mistakes.
	9-8	ABOUT AVERAGE: some writing, grammar, capitalization, and paragraphing mistakes, but the message is still clear.
	7-6	FAIR TO POOR: spelling, grammar, capitalization, and paragraphing mistakes often; bad handwriting; unclear or confusing meaning
	5-0	VERY BAD: doesn't follow rules and has lots of writing, grammar, punctuation, capitalization, and paragraphing mistakes. If the handwriting is valid or not enough to judge

Note. Adopted from Jacobs et al. (1981)

tion of the interview protocol. The researchers employed a qualitative methodology by conducting comprehensive interviews with the participants of 10 students selected from those who had received experimental treatments of learning academic writing using ChatGPT. The interview protocol was constructed by adopting the theoretical indicators of undergraduate thesis domains. The domains comprised research introduction, literature review, research method, findings, discussion, and conclusion (Luo, 2023). These domains were uttered into some questions. Some other questions regarding general perceived experiences of using ChatGPT were also provided in the interview protocol.

Data Collection and Analysis

The goal of this study is to examine how ChatGPT affects students' academic writing abilities and their experiences utilizing ChatGPT while writing at the same time. Two distinct categories of data were collected, namely, quantitative and qualitative. The quantitative data were obtained through the administration of a test comprising pre- and post-tests on academic writing. During these tests, students composed their final papers or theses encompassing chapters one through five. Participants were divided into two groups: the experimental group, which received 14 treatments involving the utilization of ChatGPT during the thesis writing process, and the control group, which underwent 14 sessions without the aid of ChatGPT, but with the aid of other non-generative AI tools. Treatments were conducted during academic writing sessions, focusing on various aspects such as crafting introductions, developing theoretical frameworks, outlining methodologies, presenting results and discussions, formulating conclusions, and compiling references. The researchers guided students in utilizing ChatGPT effectively, emphasizing originality, ethical quot-

ing, integrating GPT-generated content, and infusing personal emotions and sentiments into their writing.

Subsequently, the pre- and post-tests were evaluated by expert assessors in English academic writing from two universities. These evaluators employed the writing rubric developed by Jacobs et al. (1981) for assessment. Furthermore, an independent sample t-test was employed to investigate the variance in writing proficiency across the two groups, with data analysis being carried out via SPSS. In parallel, qualitative data were gathered employing qualitative descriptive methods to explore students' experiences with ChatGPT during thesis writing. In-depth interviews were conducted to collect qualitative data, with the following procedures employed for qualitative data analysis: data collection, reduction, identification, clarification, and verification.

RESULTS

The research outcomes have been addressed in two distinct sections. The initial section primarily focuses on the results obtained from the quantitative data. In the subsequent part, the findings derived from the qualitative data are presented.

The Effect of Using ChatGPT on Students' Academic Writing Abilities

In this research, the subjects were divided into two separate groups. One group adhered to teaching and learning academic writing using non-generative AI tools for thesis production, while the other group utilized ChatGPT as a means of help. The researchers presented ChatGPT to the experimental group. Monitoring was conducted to ensure that the control group did not utilize the ChatGPT. According to the

Table 4

Interview Guideline for Students' Perceived Experiences in Using ChatGPT to Boost Academic Writing Abilities

No	Questions	Answer
1	How did ChatGPT help you build an introduction for academic writing?	
2	How did ChatGPT help you build a theoretical framework for academic writing?	
3	How did ChatGPT help you build previous studies for academic writing?	
4	How did ChatGPT help you build the results of the thesis?	
5	How did ChatGPT help you build the discussion of the thesis?	
6	How did ChatGPT help you construct the conclusion of the thesis?	
7	What did you perceive of using ChatGPT in writing thesis?	
8	What did you experience while using ChatGPT in finding the ideas of your thesis?	
9	What do you think about the existence of ChatGPT to help students' academic writing?	
10	What do you feel about the existence of ChatGPT to help students learn academic writing?	

result of the writing tests, the researchers found the results as shown in the table below:

The presented data demonstrates a notable influence of employing ChatGPT in enhancing students' proficiency in academic writing. The data was obtained through the implementation of a test in two distinct groups, specifically referred to as the experimental and control groups. The experimental group employed ChatGPT as a tool to assist the students in formulating a conceptual framework for their thesis. In contrast, the control group refrained from utilizing ChatGPT for the construction of the thesis. Consequently, the experimental groups achieved a score of 81.11, whereas the control group obtained a score of 60.30. This suggests that the experimental group obtained higher scores, underscoring the efficacy of ChatGPT in assisting students with their academic writing tasks. The data presented in the table reveal a statistically significant disparity in test scores between the experimental and control groups (Significance Values = 0.000 < 0.05). Additionally, the control group did not achieve statistical significance (0.067 > 0.05). Further analysis indicates that the experimental group outperformed the control group in terms of achievement. Consequently, ChatGPT seems to be beneficial for instructing undergraduate students in academic writing.

Students' Perceived Experiences on the Use of ChatGPT in English Academic Writing

The researchers probed into students' perceived experiences of using ChatGPT in academic writing based on the conducted interview. Referring to their perceived experiences, the students expressed differing levels of satisfaction with regard to the use of ChatGPT across each domain of writing undergraduate theses. The students also expressed their intention to enhance their academic writing skills and engage in collaborative efforts to use a mixture of ChatGPT and their ideas.

The summary of qualitative data demonstrated that Chat GPT enhanced information retrieval and idea generation in writing research introduction, assisting in locating relevant content inside the theoretical framework, enhancing all parts of writing and fostering creativity, facilitating the organisation of the research findings, helping with syntheses of concepts and theories facilitating students' abilities

to reach conclusions effortlessly, helping to find the ease of constructing academic writing concepts, and paving the way to understand all thesis structures. However, it was also considered that ChatGPT should not be exaggeratedly relied on due to its robotic nature, and it was also necessary to control over ChatGPT generative results by rereading and humanistic editing.

In appropriate detail, the following are several interview transcripts representatively selected to demonstrate the participants' perceived experiences of using ChatGPT:

Excerpt 1

"GPT is a pleasurable tool that allows us to efficiently look for all the needed information when writing an introduction. Using ChatGPT to generate ideas for writing the Introduction of a thesis simplifies the process for me." (Student 1)

Excerpt 2

"When utilising GPT for academic writing instruction, it assists us with locating relevant content inside the theoretical framework of writing. ChatGPT assists in locating the precise theoretical framework that is required. The outcome is contingent upon the command we enter." (Student 4)

Excerpt 3

"I believe that utilising ChatGPT for academic writing can enhance my writing proficiency. It enhances all parts of writing and fosters creativity by allowing us to cooperate with the ChatGPT's results and our own thoughts. ChatGPT is quite beneficial as it assists me with organising the outcomes of my academic writing." (Student 5)

Students 1, 4, and 5 in the above transcripts collectively illustrated the transformative impact of ChatGPT on academic writing processes according to students' perceived experiences. Student 1 emphasized the efficiency and simplification ChatGPT brought to information gathering for a thesis introduction, while Student 4 underscored its role in navigating the theoretical framework with precision. Student 5 extended this perspective by highlighting ChatGPT's potential to enhance writing proficiency across various facets and its facilitation of creative collaboration between generated content and personal insights. Together, their perspectives reflected a consensus on ChatGPT's substantial benefits in streamlining research, enhancing writing quality, and fostering a symbiotic relationship between human creativity and AI-generated resources in academic endeavours. Other perceived experiences of students could be viewed in the following selected transcripts:

Table 5

Achievement scores for the Experimental and Control Group

Group	N	Mean Score Pre-Test	Mean Score Post-Test	Std. Deviation	Sig.
Experimental	25	57.15	81.11	22.988	0.000
Control	25	56.35	60.30	20.185	0.067

Excerpt 4

"ChatGPT facilitates the organisation of the research findings. Regrettably, ChatGPT is unable to perform numerical data counting." (Student 6)

Excerpt 5

"The ChatGPT feature is really beneficial as it allows us to contribute our inquiries in a designated column located at the bottom of the main page. The integration of ChatGPT technology necessitates the synthesis of our concepts and theories to bolster the research discussion." (Student 8)

Excerpt 6

"ChatGPT facilitates my ability to reach conclusions effortlessly. We just executed the command, for instance, to deduce the outcome that we have obtained during the studies." (Student 2)

The above transcripts demonstrated that student 6 acknowledged that ChatGPT facilitated the organization of research findings, although expressed regret regarding its inability to handle numerical data counting. Student 8 extolled the benefits of ChatGPT's feature that permitted user input in a designated column, emphasizing the integration of ChatGPT technology to synthesize concepts and theories for strengthening research discussions. Student 2 highlighted ChatGPT's assistance in reaching conclusions with ease, exemplified by the execution of commands to deduce study outcomes, showcasing the tool's utility in research analysis and interpretation. More on the students' perceived experiences of using ChatGPT can be seen from the following transcripts:

Excerpt 7

"The ChatGPT function facilitates the construction of my own academic writing concept with ease. Whenever I require to construct a concept regarding a specific subject, it spontaneously emerged. Even if this application is paid, I will definitely rethink its use or use other alternative AI to help write because ChatGPT just as additional tool, the writer is definitely the main tool." (Student 7)

Excerpt 8

"GPT facilitates the completion of our thesis due to its ease of construction and retrieval of necessary information. However, it is important to avoid excessive dependence on ChatGPT, as it still requires human judgement to ensure the coherence of the written output." (Student 9)

Excerpt 9

"Another advantage of GPT is its ability to organise paragraphs in a direct manner, allowing us to understand the structure of the thesis, from the general notion to the specific thought. Nevertheless, the central concept still originates from us." (Student 10)

Excerpt 10

"GPT exhibits similarities to human invention since it utilises both active and passive voice. Moreover, it possesses knowledge regarding the various tenses that can be employed. Nevertheless, it is not feasible to directly replicate every comment from ChatGPT; instead, it is necessary to re-read the text in order to enhance its naturalness." (Student 3)

As shown in the above transcripts, Students 7, 9, 10, and 3 collectively reflected on the functionalities and limitations of ChatGPT and GPT in academic writing contexts. Student 7

praised ChatGPT for its ease in constructing academic writing concepts and expressed a willingness to reconsider its use despite potential costs, recognizing it as an additional tool alongside human agency. Student 9 acknowledged GPT's role in expediting thesis completion through simplified construction and information retrieval, cautioning against excessive reliance on it and emphasizing the necessity of human judgment. Student 10 highlighted GPT's ability to organize paragraphs effectively in thesis structures while emphasizing human input in generating core concepts. Finally, Student 3 noted similarities between GPT and human language use but advised against blindly adopting its suggestions, advocating for a review process to ensure natural text flow.

DISCUSSION

The Effect of Using ChatGPT on Students' Academic Writing Abilities

The findings of the present research demonstrated a considerable improvement in students' acquisition of academic writing skills via the use of ChatGPT 3.5 as a tool for instructional support. The data were divided into two different classes, namely the control class and the experimental class. The students' achievement levels improved while they were in the control group. The researchers discovered that the score in the control group on the pre-test was 56.35, but on the post-test, it was 60.30. This information was gleaned from the data collection. When they were working on their academic writing, the students in the control class were not permitted to utilize any kind of AI or ChatGPT. Nevertheless, throughout the writing activity, participants were permitted to utilize other methods by utilizing ICT, but not ChatGPT. These methods included using Google Scholar, Eric, and other sources to support their thesis or academic writing. ChatGPT was not authorized. The students' scores did improve as a result of using that methodology, but the gains were not statistically significant. In addition, students acknowledge that while they acquire writing abilities over their learning process, they face challenges in thesis preparation, including delays in completing their writing, novelty of the ideas, and difficulties with grammar.

The experimental group demonstrated significant improvement relative to the control group under varying conditions. Initially, the pre-test average score for students stood at 65.15, which subsequently rose to 81.11 in the post-test. Statistical evaluations indicate that the performance of the experimental group surpassed that of the control group, implying that ChatGPT is an exceptionally effective resource for supporting students in their academic writing endeavours. In addition, it was discovered that the variances were consistent before the inquiry ($p = 0.067 > 0.05$), which was a positive finding. According to the findings of the study, there

was a notable disparity in the levels of test achievement (F = 0.058; p 0.000 < 0,05 for each comparison). Hence, the use of ChatGPT in academic writing made it easier for students to build the idea. When the ChatGPT was first shown to the students, they responded with a great deal of interest and curiosity, indicating a significant desire to make use of the ChatGPT. Based on student interviews, it was revealed that while students rely on ChatGPT for assistance, they do not rely solely on it. Instead, they carefully review and confirm the data that ChatGPT provides to make sure it is pertinent and in line with their preferences. According to AlMarwani (2020) research, there are three models of student writing in academic settings: socialization, academic literacy, and study skills. After conducting the test, the researchers found that almost all three settings achieved a very high score. As stated by AlMarwani (2020), the socialization model holds the assumption that being proficient in the fundamental guidelines of a certain academic discourse is necessary for becoming a great academic writer. The researchers learned from the interview that it was easier to organize academic writing while using ChatGPT. Besides, the students also have good literacy while using ChatGPT because ChatGPT can make a review of an article, so the students found that simpler. For the last aspect, the researchers found that the organization, grammar, word choice, and spelling were improved by using ChatGPT. According to Tuzlukova et al. (2016) and Apriani et al. (2021), the utilization of online learning environments has been found to result in improvements in students' writing abilities, productivity, and proficiency in computer usage. Al Yakin et al. (2023) explained that ChatGPT holds promise as a beneficial tool for academic authors, since it has the capacity to enhance writing techniques and outcomes. They also posited ChatGPT employed as individualized learning supports have a beneficial effect on successful learning and student satisfaction. According to Knill, Carlsson, Chi, and Lezama in Vanichvasin (2021), ChatGPT assisted the teacher in identifying student deficiencies through questions and assessing student learning to give personalized support. Furthermore, students in this study utilized ChatGPT as a tool to come up with ideas for their writing assignments rather than using it as a whole. To further correlate ideas with one another, ChatGPT still needs human hands to touch. Consequently, users of GPT Chat, particularly students, should not rely exclusively on current technology since this may lead to ideas for academic writing tasks becoming sporadic. Researchers must supervise students in order to guarantee that they use ChatGPT responsibly. In line with Fuchs (2023), in order to effectively tackle the challenges, it is imperative for universities to prioritize the utilization of ChatGPT as a supplementary tool, rather than a substitute for, human interaction. Institutions have to establish norms and ethical frameworks for the utilization of ChatGPT, guaranteeing the safeguarding of student privacy and the reduction of prejudice

Additionally, multiple research efforts have documented the utility of ChatGPT as an aid in writing. Evidence supports the effectiveness of ChatGPT in improving writing capabilities. These investigations highlight the prospective benefits of using ChatGPT to boost productivity, improve language skills, and provide precise information. They highlight the potential of ChatGPT to aid writers in rapidly generating grammatically correct content. The outcomes of this research suggest that using the characteristics of ChatGPT may assist authors in improving their writing processes and generating higher-quality material 2024/10/23.

In general, both quantitative and qualitative results indicated that ChatGPT's use in academic writing instruction was very beneficial. A methodical, rigorous, and careful education is necessary for writing. According to Ayranci and Mete (2017), the teacher assumed the role of a mentor throughout the process-based writing education, considering the unique characteristics of each student and not only treating writing as a classroom activity. Based on the provided information and the study results, it is reasonable to deduce that teaching writing is not limited to the classroom alone. Therefore, using ChatGPT to improve writing education outside the classroom setting would be advantageous.

The study also found that ChatGPT has the potential to assist students in improving their academic writing. Possible applications of ChatGPT include promoting diverse perspectives in scientific research, expediting the publishing timeline via writing streamlining, and enhancing the invention process. In addition to these potential outcomes, it has the potential to undermine the autonomy of human researchers and jeopardize the authenticity and excellence of their work. Based on the writers' interactions with ChatGPT, it can be concluded that ChatGPT serves as a valuable research tool for efficiently creating articles. ChatGPT can promptly answer basic inquiries about academic research researchers.

Students' Perceived Experiences on the Use of ChatGPT in English Academic Writing

ChatGPT is a useful study tool since it is also easily accessible to researchers everywhere, whenever they need it, as long as they have an internet connection. Additionally, its ability to provide novel and original results depending on input can support the production of new thoughts, viewpoints, and insights by researchers. By helping with tasks like idea generation, literature summarizing, and writing aids, ChatGPT can boost productivity and give researchers more time to focus on other aspects of their study (Muthmainnah et al., 2024). With all these advantageous, it does not mean that the students will depend on this technology. Based on the interview, the students stated that in writing a paper, the author assumes the role of the primary character, whereas ChatGPT functions as a tool. If there is a cost associated with

its usage, writers should reconsider its usage or opt for an alternative AI for assistance.

In this study, the researchers used a sample research topic to evaluate the ChatGPT's potential for use in academic research. The findings demonstrated that ChatGPT was capable of producing a standard research paper abstract when given precise instructions. However, it cannot consistently create the different research paper portions. In the introductory portion, ChatGPT produces a fictional description of the issue and identifies areas where further investigation is needed. The lack of access to primary sources hinders the ability to evaluate the existing research gap pertaining to a specific research topic. Rahman et al. (2023) state that ChatGPT has the capability to facilitate the development of novel research avenues, the identification of relevant research subjects, and the formulation of hypotheses. Since ChatGPT lacks the ability to generate research questions, issue statements, research gaps, or hypotheses with a high level of accuracy, it is highly recommended that academic researchers only employ it to a limited extent for this essential aspect. Hence, the researchers can proficiently employ ChatGPT for the overarching concept. Nevertheless, it is imperative that they directed the majority of their studies towards themselves.

Additionally, the researchers observed that ChatGPT engages in the fabrication of inaccurate citations while disseminating literature reviews. Upon verifying the references in academic databases, it was determined that all of them were fabricated. The main goal of creating a literature review is to synthesize the literature; hence, the tool must also do that. Due to its inability to access actual data, it cannot perform statistical analysis. The program cannot perform empirical analysis because one cannot upload data files into ChatGPT. But if the transcriptions of the data are available, ChatGPT can produce some respectable results for a few qualitative data studies. As a result, even while utilizing ChatGPT, students must still rely on their own writing abilities to produce text that is coherent, cohesive, and harmonious. Make ChatGPT an extra writing tool rather than a stand-in for people, as stated by (Fuchs, 2023). Therefore, even with ChatGPT's assistance, students still want direction for using ChatGPT sensibly and effectively.

In addition, if the researchers can give all the details about the research methodologies employed, it will also be possible to compose a suitable methodology. To be effective in this situation, your prompt must be precise. For a rough draft of their methods section's design, academic scholars may use ChatGPT. To be accurate, all methodology-related information must be entered into the system by the type of study being conducted (qualitative or quantitative) (Rahman et al., 2023). The following section is just one of several restrictions on utilizing ChatGPT when producing research publications. Within the realm of scholarly investigation, where appreciation for uniqueness and ingenuity is paramount, ChatGPT's primary deficiency lies in its inability to generate innovative and fresh ideas. While ChatGPT is capable of generating cohesive and well-structured language, it cannot generate original and innovative ideas. Furthermore, ChatGPT is trained using a substantial collection of textual data that might potentially include biases and errors, leading to distorted results and diminished effectiveness. One drawback is that, being an AI model, ChatGPT lacks accountability for the dependability and correctness of its generated conclusions. In the realm of academic research, where the principles of responsibility and transparency have great significance, this situation may present challenges. Another limitation is seen in ChatGPT, since it cannot fully understand the context of the language it generates. As a result, it can generate irrelevant or incorrect information, especially in situations that need a detailed comprehension of the topic (AlAfnan et al., 2023). Moreover, the researchers' capacity to authenticate the data and ascertain the underlying factors contributing to bias or inaccuracy is constrained by the results generated by ChatGPT's inclination towards intricate interpretation and conceptual complexities. Thus, a human touch is still required when writing academically, even in the age of ChatGPT. Therefore, during this study, researchers fully supervised and guided students in using ChatGPT. In order to prevent assigning high grades to ChatGPT responses, the language teacher will develop a comprehensive evaluation document for their submission-based assessments. In addition, they will engage in the development of a comprehensive rubric that highlights the inclusion of individualized characteristics and alternate options in their response.

Despite these justifications, ChatGPT can be an effective research device, especially when combined with other strategies and methodologies. There is a lot of promise for ChatGPT to be used in academic research, including increased effectiveness, precision, and communication. By making use of these benefits, researchers may better understand their study fields and share their discoveries with a larger audience. The use of ChatGPT in academic research is a fast-growing area. Researchers can anticipate that as technology advances, even additional advantages will become known.

One critical issue that arises with the use of ChatGPT in academic writing is the question of originality. While ChatGPT can assist students in generating ideas and organizing their writing, it also raises concerns about the authenticity of the produced work. It is essential to address how ChatGPT might impact student originality, ethics, and authorship. During the study, it was observed that while ChatGPT helped students formulate ideas, there was a need for students to critically evaluate and refine the generated content to ensure it reflected their original thoughts and understanding. This process of critical engagement is crucial for maintaining the integrity of the students' work. Moreover, the use of ChatGPT should be framed within a pedagogical approach that emphasizes the development of students' independent

writing skills. Educators should provide clear guidelines on how to use ChatGPT responsibly and encourage students to view it as a supplementary tool rather than a substitute for their own intellectual efforts. By doing so, students can benefit from the advantages of AI while still honing their original writing abilities.

The present study is not free from limitations and weakness. The evaluation of student texts was conducted by a single individual, which may limit the robustness and validity of the findings. Future studies should consider using multiple evaluators to achieve inter-rater reliability. This approach can enhance the credibility of the evaluation process by ensuring that the assessment is not biased by the perspective of a single evaluator. Additionally, the dependency of students on ChatGPT for academic writing raises concerns about their ability to achieve similar literacy levels without the software. This dependency might affect their future academic performance if they no longer have access to ChatGPT, particularly if OpenAI transitions to a subscription-only model. The study also did not measure the long-term impact on students' writing abilities without ChatGPT. While ChatGPT can aid in idea generation and text organization, students need to critically engage with the AI-generated content to develop genuine academic writing skills. These limitations highlight the need for a balanced approach in using ChatGPT, where students are encouraged to use the tool as a supplementary resource rather than a primary means of completing their assignments.

CONCLUSION

The present study has demonstrated that integrating ChatGPT into English academic writing instruction significantly enhances students' writing abilities. The experimental group, which utilizes ChatGPT, demonstrates marked improvement in their writing skills compared to the control group, highlighting the tool's effectiveness in supporting the development of academic writing. This positive effect is reflected in the statistically significant differences in test scores between the two groups. These findings suggest that ChatGPT serves as a valuable educational tool, aiding students in generating ideas, organizing content, and refining their writing. Beyond the quantitative improvements, students' perceived experiences with ChatGPT are largely positive. Qualitative feedback indicates that students find ChatGPT to be a helpful resource for accessing accurate information, generating new ideas, and structuring their academic work. However, the study also emphasizes the impor-

tance of students maintaining a balanced approach, using ChatGPT as a supplementary tool rather than becoming overly reliant on it. This caution ensures that students' writing reflects their own understanding and critical thinking.

The implications of these findings are significant for educators and educational institutions. Integrating AI tools like ChatGPT into academic curricula potentially enhances not only writing skills but also digital literacy and critical engagement with AI-generated content. Educators should consider incorporating such tools into their teaching strategies while emphasizing the importance of critical thinking and independent learning. Looking forward, there is a need for further research to explore the broader applications of AI tools like ChatGPT in other aspects of language learning, including reading, listening, and speaking. Future studies can also investigate the ethical considerations and challenges associated with the use of AI in educational contexts, such as issues of dependency, originality, and the potential impact on students' critical thinking abilities. Additionally, examining how AI tools can be tailored to meet the diverse needs of learners, including those from different cultural and linguistic backgrounds, is crucial in maximizing the benefits of AI in education.

DECLARATION OF COMPETING INTEREST

None declared.

AUTHORS' CONTRIBUTION

Eka Apriani: conceptualization; data curation; investigation; methodology; writing – original draft.

Sholihatul Hamidah Daulay: formal analysis; investigation; software; writing – review & editing.

Fitria Aprilia: funding acquisition; project administration; validation.

Abdul Gafur Marzuki: formal analysis; validation.

Idi Warsah: data curation; methodology.

Dadan Supardan: formal analysis; recourses.

Muthmainnah: supervision; visualization.

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