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THE EFFECTS OF ARTIFICIAL INTELLIGENCE USAGE ON STUDENT LEARNING BEHAVIOR AND CRITICAL THINKING SKILLS: CORRELATION STUDY ON STUDENTS' ACADEMIC WRITING

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ABSTRACT

This study aimed at examining the impact of artificial intelligence (AI) on students' learning behaviour and critical thinking skills in academic writing. The research background is based on the increasing use of AI technology in higher education, particularly in academic writing activities. This research integrated quantitative and qualitative descriptive methods that aim to describe in depth the use of AI technology in students' academic practices in academic writing activities seen from the tendency of student learning behaviour with AI and students' critical thinking skills in the context of academic writing learning, supported by quantitative data. The data were taken using a purposive sampling technique, including 78 students who met the criteria. The research findings show that AI positively contributes to increased learning efficiency, understanding of complex material, and student motivation and independence. There is a positive correlation between AI use and learning behaviour and critical thinking skills, although a tendency toward instant use, which can potentially reduce depth of thought, was also found. Correlations between the variables indicate moderate to high levels of strength. Then, the findings of this research are expected to contribute to designing a pedagogical approach that is adaptive to the digital era that maintains basic educational values such as autonomy of thought, academic ethics, and the development of students' intellectual capacity.

Keywords: *Artificial intelligence, academic writing, critical thinking, learning behavior.*

INTRODUCTION

The development of technology leads to advanced artificial intelligence (AI) technology that can be applied to all aspects of life, such as social, cultural, economic, scientific, and educational, even though it is considered as capable as human thinking, causing many people to worry about the negative impact of the technology. In education setting, for example, many people concern about the negative impact caused by these technological advances in the usage of AI in learning process. This issue is not only a concern about the impact on the development of students' abilities and competencies, but also a concern about the impact on ethical violations in education. For example, the use of AI-based applications among students in academic activities, such as the use of chatbots based on Large Language Models like ChatGPT, which can help answer academic questions, compose scientific papers, and provide suggestions for improvement in coursework, including in academic writing courses that considered to cause the students' dependence on technology and unwise usage. Therefore, these phenomena mark a significant change in student learning behaviour, from one that was previously based on exploration and independent reflection to one that is more dependent on technological assistance.

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In line with the advancement of AI technology, it is viewed as a tool that offers significant business opportunities and rapid problem-solving, so that it cannot be denied or avoided. In higher education, for example, AI is considered to have high benefits to increase academic productivity, learning efficiency, and rapid access to information. However, AI-based technology offers significant opportunities for learning productivity. The usage of this technology also presents significant challenges for educators, particularly regarding the potential negative impacts on students' cognitive abilities and learning behaviour, that impact on declining critical thinking skills and a dependency attitude that affects students' independence. In line with these phenomena, showed that the use of ChatGPT can lead to technological dependence, laziness in thinking, and even weaken students' analytical skills. A similar sentiment was expressed that the uncontrolled use of AI in academic activities can reduce students' learning independence and reasoning quality. Meanwhile, (Awad & Moosa, 2023) found that the unwise and uncritical usage of AI causes high risks for students in reducing students' self-independence and intellectual autonomy. Examining the results of these studies, the uncontrolled use of AI can actually create a generation of passive students.

However, several studies have demonstrated the positive benefits of using AI in educational contexts. For example, (Kamal & Iskander, 2024) stated that by considering the importance of student autonomy in learning, e.g. the ability of students to manage their learning process independently, choices of appropriate strategies, and development of control over students' thinking processes the targeted use of ChatGPT in learning English as a foreign language (EFL) can improve students' learning motivation, creativity, and critical thinking skills. Meanwhile, (Khoudri et al., 2023) in their study on project-based learning emphasized the importance of AI integration to support active learning by considering that students are not only consumers of information, but also processors and producers of knowledge. The research finding showed that the use of AI, such as ChatGPT, can be constructive when it is used within a pedagogical framework that encourages active participation, reflection, and personal responsibility. In addition, (Putri & Panduwinata, 2025) stated that the use of AI in the learning process can facilitate critical thinking skills by providing instant feedback and diverse perspectives in problem-solving. (Andalusia, 2025) even showed that the use of ChatGPT in learning can strengthen problem-solving and reflective thinking skills, especially when accompanied by appropriate teaching strategies, such as problem-based learning or self-organized learning.

Highlighting several recent studies, it is identified that the students' use of AI has a significant correlation with academic performance, critical thinking, and problem-solving skills. (Bukhari & Akhtar, 2025) found that the use of AI tools was positively correlated with students' problem-solving skills and academic performance, showing that students who utilize AI effectively tend to have better academic outcomes. However, this study did not specifically examine how students' learning behavior changes in the context of AI use, particularly in academic writing activities. Similar findings were also presented by (Pervaiz et al., 2025), who found a positive correlation between AI use and critical thinking skills, indicated by the correlation values ranging from 0.25 to 0.35 ($p < 0.01$). However, this study highlighted the potential for a decline in critical thinking skills in students who rely too heavily on AI in academic writing. The finding indicates that the relationship between AI and critical thinking is not always linear, but rather influenced by the intensity and method of AI use. Furthermore, research conducted by (Szmyd & Mitera, 2024) confirmed that the use of AI in education influences the development of critical thinking and problem-solving skills. This study also underscored the importance of varying information sources in the learning process, including the use of AI as one source. However, this research focused more on cognitive aspects and did not explore the behaviour dimensions of student learning in depth.

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In addition, viewed from the behaviour dimensions of learning began to receive attention in research by (Alkam et al., 2026) that AI use had a negative correlation with certain aspects of academic writing, particularly when linked to academic integrity. The negative correlation values (ranging from -0.12 to -0.22) indicate that increased use of AI without adequate controls can lead to a decline in the quality of critical thinking in writing. This study introduced a moderating variable, academic integrity, but did not explicitly examine changes in student learning behaviour as the primary variable. (Suryanto et al., 2025) found that the use of AI can encourage passive learning behavior, where students tend to rely on technology without engaging in in-depth thought processes. This has the potential to hinder the development of critical thinking skills and creativity. These findings strengthen the argument that the use of AI needs to be balanced with appropriate pedagogical strategies so as not to reduce the quality of learning. Another study conducted by (Ramezani et al., 2025) showed that the relationship between AI usage and critical thinking is mediated by self-learning ability. Students with high self-learning ability tend to utilize AI more effectively to improve their critical thinking skills. However, this study did not specifically focus on the academic writing context.

In the academic writing context, several studies indicate different findings. (Rizkiani et al., 2024) showed that the use of AI tools in foreign language learning can influence students' motivation and emotional engagement. In addition, there were different student behaviours during the intervention, so that it was indicating that AI not only influenced the learning outcomes but also the learning process itself. However, this study was limited to the EFL context and cannot generalize the findings to a broader student population. Meanwhile, (Aymen & Zakarya, 2024) emphasized that AI can create a learning environment that encourages critical thinking. This inquisitive environment allows students to explore ideas more deeply. However, this research was more conceptual in nature and had not yet tested the empirical relationship between AI use and student learning behaviour. Different from the previous studies, (Deep & Chen, 2025) highlighted the psychological and behaviour dimensions of AI use and found that AI has a significant impact on writing skills, critical thinking, and academic integrity which influence how students interact with the technology. However, this study focused more on comparing AI-assisted writing with traditional methods and therefore did not specifically examine the correlational relationships between these variables. Furthermore, vied from the meta-analysis, the study done by (Ilgun Dibek et al., 2025) showed that AI has a significant impact on higher-order thinking skills, including critical thinking. However, the meta-analysis also showed variation in research results, indicating that contextual factors such as learning behaviour and AI usage strategies play a significant role in determining outcomes. In addition, (Suriano et al., 2025) showed that student interaction with AI reflectively, such as ChatGPT, can improve complex critical thinking skills, when it is used passively, AI can actually decrease student cognitive engagement.

Examining the previous research explored, at least three research gaps can be identified. First, most studies focus on the direct relationship between AI use and critical thinking skills or academic performance, but not many integrate learning behaviour variables as important factors in this relationship. Second, although there is research highlighting the impact of AI on academic writing, there are still limited studies that specifically examine the correlational relationship between AI use, learning behaviour, and critical thinking skills in the context of student academic writing. Third, the diverse research results show inconsistencies, indicating the need for further research with a more comprehensive approach. Therefore, according to the phenomenon of AI usage among higher students and previous research issues regarding AI, this study explores comprehensively the effects of AI usages on the dynamics of students' learning behaviour and cognitive development, by emphasizing how students respond to and apply the role of AI in the process of critical thinking and scientific writing to obtain a

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comprehensive picture of the relationship between AI use, learning behaviour, and critical thinking skills in specific contexts in academic writing activities. Thus, by integrating two main focuses, learning behaviour and critical thinking skills, into one research framework, and the correlation between both aspects in the context of AI usage in students' academic writing activities, the findings of this study are expected to contribute to designing a pedagogical approach that is adaptive to the digital era that maintains basic educational values such as autonomy of thought, academic ethics, and the development of students' intellectual capacity.

METHOD

This study integrated quantitative and qualitative descriptive methods that aim to describe in depth the use of AI technology in students' academic practices in academic writing activities, seen from the tendency of student learning behaviour with AI support and students' critical thinking skills in the context of academic writing learning supported by quantitative data. Data were collected using a questionnaire containing students' behavior and perceptions in the use of AI, students' abilities in writing academic writing, and critical thinking skills from students at one of the private universities in Bandung, Indonesia. The data were taken using a purposive sampling technique, including 78 students who met the criteria of being active students and having used AI/ChatGPT in the context of academic writing learning. To facilitate data management and distribution, the questionnaire was distributed using Google Forms without providing the students' identities. Meanwhile, in order to obtain the correlation level for each variable, calculations were applied using the SPSS program version 26. The results of the calculations are presented in charts and tables and interpreted to give a comprehensive description.

FINDINGS AND DISCUSSION

Students' usage of Artificial Intelligence

The results of this study indicate that the artificial intelligence tools have been widely used by students in completing academic assignments, especially in the context of academic writing and understanding lecture material. From the five AI-based applications used by students, ChatGPT was the application most frequently used by the students in completing course assignments and academic papers, while Google Translate ranks below it, and Gemini, DeepL, and Grammarly tend to be used less frequently. The percentage of AI use by students is shown in the following percentage chart in Figure 1.

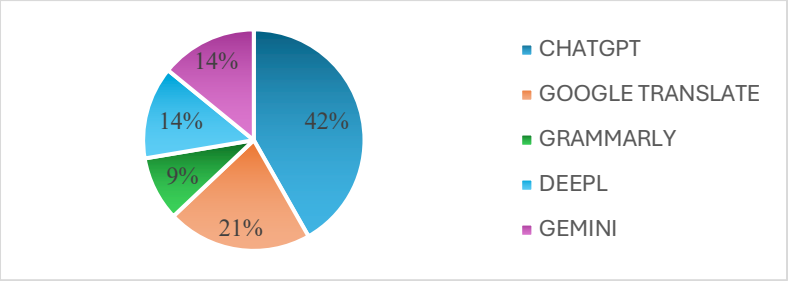

Figure 1. Frequencies of students' AI usage in academic writing

Furthermore, data analysis obtained from the questionnaire show that the use of AI was assessed as providing a positive contribution to improve time efficiency, thinking structure,

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and students' understanding of complex topics, as indicated by a positive relationship between the use of AI and students' learning behavior, the use of AI and students' critical thinking, and learning behavior and students' critical thinking. The description of each relationship is explained in the following explanation.

Students' Behavior towards Artificial Intelligence Usage

Student behavior in using AI in this study focuses on independence, learning habits, learning motivation and self-confidence of students. Data analysis from the student questionnaire shows that student behavior in using AI on independence, learning habits, learning motivation and self-confidence of students was positively correlated with a moderate level as indicated by a moderate response of 63%. Student independence is demonstrated by their continued active use of manual literature and their use of AI-based applications as tools to assist them with assignments and academic writing. This is demonstrated by over 70% stating that AI had impacted either positively or negatively their learning habits. These findings indicated a shift in the way students' access and process information. A comparison of these behavior levels is shown in Figure 2.

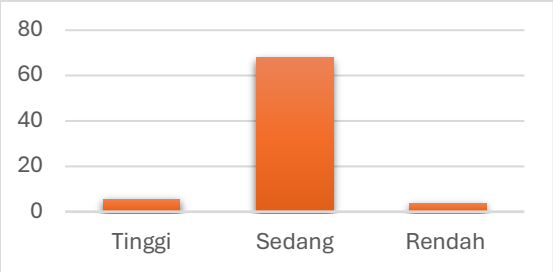

Figure 2. Comparison of student behavior levels in using AI

In addition, a positive correlation between AI usage and students' learning behavior was indicated by a Pearson correlation level of 1 for AI usage and a Pearson correlation level of 0.579 for student learning behavior, as shown in the correlation table in Table 1. Although both variables have a positive relationship, the relationship is at a moderate level, as shown in Figure 2.

Tabel 1. Level of correlation between AI Usage and Students' Learning Behavior

Correlations

		AI	Perilaku
AI	Pearson Correlation	1	.579**
	Sig. (2-tailed)		.000
	N	78	78
Perilaku	Pearson Correlation	.579**	1
	Sig. (2-tailed)	.000	
	N	78	78

Referring to the correlation between these two variables, the findings also indicate a tendency for students to use AI for instantaneous activities, such as quickly seeking answers, which can potentially undermine deep thinking processes. While considering to the level of reliance on AI remains within reasonable limits, it remains a significant issue that requires attention concerning to the learning planning and efforts to strengthen critical thinking skills. The indicators are indicated in Table 2.

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Tabel 2. Students' behavior of AI usage

Behaviour	High	Moderate	Low
Keep searching and reading manual references	67.5	5	1.3
More motivated in independent learning	63.8	27.5	8.8
More confident in doing course assignments	40	41.3	18.8
Becoming less active in reading literature	26.3	21	47.6
Faster in Completing course assignments	38.8	23.8	37.5
Changing in learning habbit	42.5	28.7	28.8
Using AI as a tool rather than as a substitute for learning efforts	83.8	10	6.3

Thus, the results of this analysis indicate that a strategic learning method that integrates AI-based learning methods with an approach that supports student learning independence to build motivation and behavioral engagement and critical thinking in students regarding the learning material is needed. In line with this research finding, this is indicated by the majority of students feeling that AI encourages independent learning motivation, supporting the theory of (Kamal & Iskander, 2024) regarding the role of AI in encouraging learner autonomy.

Students' AI usage and Critical Thinking Competencies

The results of the questionnaire data analysis show that there is a positive contribution between the use of AI and increasing students' critical thinking skills with a high correlation as shown in Figure 3.

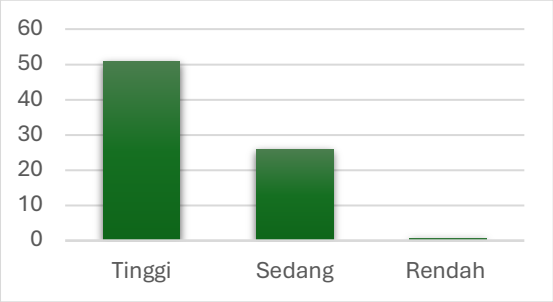

Figure 3. Students' level of Critical Thinking Competencies

This data analysis is supported by the high students' response shown that as many as 64.2% felt that AI helped them in understanding the problem formulation in doing academic writing. This response shows that the use of AI helped the students in thinking critically in formulating problems in academic writing, so that AI was considered to be able to encourage the prior scientific framework. In addition, in their activities of understanding and writing resource of references in their academic writing, as many as 76.1% of students were still actively paraphrasing and analyzing the material and literature resources. This data shows that students engaged critically with the material and problems both in studying the material or writing academic papers despite and considered that AI technology was a tool to assist their academic activities. Therefore, these results of the data analysis indicate that the students tent to respond highly to the indicator of critical thinking skills and show a positive relationship that the use of AI in their academic activities, especially in academic writing activities, had a positive relationship with a strong or high tendency. The correlation of this relationship is shown by the Pearson correlation of AI at 1 and critical thinking at 0.745 as shown in the correlation Table 3.

P-ISSN 2656-9094
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Tabel 3. Level of correlation between Students' AI usage and Critical Thinking Competencies

Correlations

		AI	Critical
AI	Pearson Correlation	1	.745**
	Sig. (2-tailed)		.000
	N	78	78
Critical	Pearson Correlation	.745**	1
	Sig. (2-tailed)	.000	
	N	78	78

Considering deeply the results of the research, although the data show a strong relationship between AI use and students' critical thinking skills, there remains concern that there might be a decline in students' critical thinking skills, for example, students' academic writing and logical thinking. This concern is demonstrated by the students' response data showing that 46.3% of students stated that AI makes it faster to complete assignments, but does not always understand them, and 35% of students agreed that "AI reduces the ability to think critically independently." According to the data, although the majority of students felt that the use of AI technology helped them improve their critical thinking, some of them feel that the use of AI technology reduced their ability to think critically. This condition can be an important concern that the use of AI can be a tool that weakens students' critical thinking abilities if it is not accompanied by self-control and the habit of thinking critically and reflectively towards learning materials and problems because excessive use of AI will create a dependency on the use of AI which can affect mental activity in forming opinions or creating independent solutions to a problem.

Learning Behaviour and Students' Critical Thinking Competences

The results of the data analysis indicate that the majority of students use AI technology as a tool to assist their academic writing activities, rather than as a substitute for processes and facilities in academic activities. This is evident from the dominant positive responses in aspects of writing skills, constructing arguments, and improving vocabulary. The data shows that as many as 58.8% of students felt AI technology assisted in creating or formulating arguments logically. This means that in this case, the use of AI in student academic activities played a role in assisting students' thinking processes, which are an important element in the ability to think critically, such as helping to create a structured problem formulation in academic writing activities. Furthermore, the data demonstrates positive behavior indicating that the students did not simply copy literature resources resulted from AI in completing their course assignment, but rather use them as initial references to maintain their existing thinking. This is indicated by the fact that 75% of students strongly agree and agree that they should conduct independent paraphrasing and analysis when taking references using AI technology. Furthermore, the correlation between these two variables shows a positive relationship with a high correlation level, indicated by a Pearson correlation of 1 on student behavior towards the use of AI and critical thinking skills at 0.611, as shown in the following correlation Table 4.

Tabel 4. Level correlation of students' learning behaviour toward critical thinking competences

Correlations

		Perilaku	Critical
Perilaku	Pearson Correlation	1	.611**
	Sig. (2-tailed)		.000
	N	78	78
Critical	Pearson Correlation	.611**	1
	Sig. (2-tailed)	.000	
	N	78	78

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According to the correlation Table 4, the correlation between student learning behavior using AI and critical thinking skills is at a high level supported by student responses in the statement of AI technology for students can strengthen students' critical thinking frameworks when it is used wisely for academic writing activities. Finally, the relationship between learning behavior and critical thinking skills also shows a strong correlation. Students who performed positive learning behaviors tent to have better critical thinking skills, particularly in academic writing. It is strengthened by the argument that learning strategies that effectively integrate AI can support the achievement of higher-order thinking competencies, as long as they are accompanied by a pedagogical approach that fosters independence, active engagement, and critical thinking habits. Therefore, the usage of artificial intelligence in academic writing can be a potential tool in improving the quality of student learning and critical thinking competencies, when it is companied by a digital literacy, ethical understanding, and appropriate pedagogical approach.

CONCLUSION

The artificial intelligence (AI) used in academic writing activities had a positive influence on learning behaviour and critical thinking skills competencies. Applications based AI, e.g. ChatGPT and Google Translate, are widely used to improve efficiency, conceptual understanding, and develop arguments and structure scientific writing. The use of AI has been shown to encourage students' motivation for independent learning and cognitive engagement, although some still show a tendency towards instant use that can weaken critical thinking processes. The correlation found between AI use, learning behaviour, and critical thinking skills is at a moderate to strong level, indicating that AI plays an effective role as a tool when used wisely. Therefore, the integration of AI in the learning process needs to be accompanied by a pedagogical approach that supports independence, reflection, and digital literacy, to ensure this technology truly strengthens, rather than replaces, students' critical thinking processes.

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