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THE POWER OF AI IN EDUCATION: EXPLORING CHATGPT'S IMPACT ON STUDENTS' LEARNING

POTENSI KECERDASAN BUATAN DALAM PENDIDIKAN: MENELITI DAMPAK CHATGPT TERHADAP PROSES BELAJAR SISWA

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ABSTRACT

This study investigates the impact of ChatGPT usage on students' learning in the Business Administration department at Politeknik Negeri Pontianak. Using a quantitative cross-sectional survey design, data was collected from a sample of active students and analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM). The measurement model confirmed the reliability and validity of the constructs. The structural model revealed that ChatGPT usage had significant positive effects on critical thinking skills ($\beta = 0.654$, $p < 0.001$), learning efficiency ($\beta = 0.748$, $p < 0.001$), and material comprehension ($\beta = 0.703$, $p < 0.001$), explaining 42.8%, 56%, and 49.4% of the variance, respectively. However, ChatGPT usage did not significantly impact academic achievement ($\beta = -0.102$, $p = 0.125$). These findings suggest that while ChatGPT can enhance critical thinking, streamline learning, and facilitate deeper understanding, its direct influence on grades and overall performance is more complex. Educators should carefully consider course goals and contexts when implementing ChatGPT. Future research could explore moderating factors, long-term effects, and the evolving role of AI in education to harness its potential in supporting student learning experiences.

Keywords: *Artificial Intelligence, Chatgpt, Learning Efficiency, Critical Thinking Skills, Material Comprehension, Academic Achievement, Pls-Sem, Business Administration Education.*

ABSTRAK

Penelitian ini mengkaji dampak penggunaan ChatGPT terhadap proses belajar mahasiswa di Jurusan Administrasi Bisnis Politeknik Negeri Pontianak. Dengan menggunakan desain survei kuantitatif cross-sectional, data dikumpulkan dari sampel mahasiswa aktif dan dianalisis menggunakan Partial Least Squares Structural Equation Modeling (PLS-SEM). Model pengukuran mengonfirmasi keandalan dan validitas konstruk. Model struktural menunjukkan bahwa penggunaan ChatGPT memiliki dampak positif yang signifikan terhadap keterampilan berpikir kritis ($\beta = 0.654$, $p < 0.001$), efisiensi belajar ($\beta = 0.748$, $p < 0.001$), dan pemahaman materi ($\beta = 0.703$, $p < 0.001$), menjelaskan 42,8%, 56%, dan 49,4% varians, masing-masing. Namun, penggunaan ChatGPT tidak secara signifikan mempengaruhi prestasi akademik ($\beta = -0.102$, $p = 0.125$). Temuan ini menunjukkan bahwa meskipun ChatGPT dapat meningkatkan pemikiran kritis, mempermudah proses belajar, dan memfasilitasi pemahaman yang lebih dalam, pengaruh langsungnya terhadap nilai dan kinerja keseluruhan lebih kompleks. Pendidik harus mempertimbangkan dengan cermat tujuan dan konteks kursus saat mengimplementasikan ChatGPT. Penelitian masa depan dapat mengeksplorasi faktor moderasi, efek jangka panjang, dan peran AI yang terus berkembang dalam pendidikan untuk memanfaatkan potensinya dalam mendukung pengalaman belajar siswa.

Kata Kunci: Kecerdasan Buatan, Chatgpt, Efisiensi Pembelajaran, Keterampilan Berpikir Kritis, Pemahaman Materi, Prestasi Akademik, PLS-SEM, Pendidikan Administrasi Bisnis.

INTRODUCTION

The rapid advancement of artificial intelligence (AI) has brought about significant changes in various aspects of life, including education. AI-powered tools, such as ChatGPT, have the potential to revolutionize the way students learn and interact with educational content (Chen et al., 2020). ChatGPT, developed by OpenAI, is a large language model trained to generate human-like responses to text-based prompts (OpenAI, 2021). This technology has garnered attention from educators and researchers alike, as it offers new opportunities for

personalized learning, instant feedback, and enhanced student engagement (Winkler & Söllner, 2018). Recent studies have highlighted the benefits of incorporating AI tools like ChatGPT into the learning process. For instance, Diantama (2023) found that ChatGPT can increase student engagement, learning motivation, 21st-century skills, and reduce student anxiety. Similarly, a study by Noviati and Belajar (2022) revealed that 90% of students agreed that AI tools enhance their learning motivation. Furthermore, Nelliraharti (2024) discovered a strong positive correlation (coefficient of 0.600) between the use of AI and increased learning motivation. The application of AI in education extends beyond motivation, as it has been shown to impact academic performance and critical thinking skills. Gultom et al. (2024) reported that the use of the AI-based application Wordwall increased students' learning motivation from 48.25% to 85.8%. Moreover, Naila et al. (2023) found that AI-assisted learning tools improve students' independence, enthusiasm, persistence, and enjoyment in problem-solving. Despite the growing body of research on AI in education, there is a need for further investigation into the specific effects of ChatGPT on the learning process, particularly among students in different disciplines and educational settings. This study aims to examine the impact of using ChatGPT on the learning process of students in the Business Administration department at Politeknik Negeri Pontianak. By exploring the relationship between ChatGPT usage and variables such as academic achievement, critical thinking skills, learning efficiency, and material comprehension, this research seeks to contribute to the understanding of AI's role in higher education. The findings of this study may have practical implications for educators and institutions seeking to integrate AI tools into their curricula. By identifying the potential benefits and challenges of using ChatGPT in the learning process, this research can inform the development of effective strategies for incorporating AI in education. Furthermore, the results may provide insights into the ways in which ChatGPT can be leveraged to support personalized learning, enhance student engagement, and improve overall educational outcomes.

LITERATURE REVIEW

The integration of artificial intelligence (AI) in education has been a topic of growing interest among researchers and educators. AI-powered tools, such as ChatGPT, have shown potential in enhancing the learning experience and improving educational outcomes (Chen et al., 2020). This literature review explores the current state of research on AI in education, focusing on the use of chatbots and their impact on student learning, motivation, and performance.

Chatbots in Education

Chatbots are AI-based conversational agents that can interact with users through natural language processing (Winkler & Söllner, 2018). In educational settings, chatbots have been employed for various purposes, such as providing personalized tutoring, answering student queries, and facilitating collaborative learning (Smutny & Schreiberova, 2020). Pérez et al. (2020) identified four main categories of chatbot applications in education: adaptive tutoring and personalization, intelligent assessment and management, profiling and prediction, and new products like educational robots and VR/AR applications.

Impact on Learning Motivation

Several studies have investigated the impact of AI tools on student learning motivation. Diantama (2023) found that ChatGPT can increase student engagement, learning motivation, 21st-century skills, and reduce student anxiety. Similarly, Noviati and Belajar (2022) reported that 90% of students agreed that AI tools enhance their learning motivation. Nelliraharti (2024) discovered a strong positive correlation (coefficient of 0.600) between the use of AI and increased learning motivation. These findings suggest that AI-powered chatbots can play a significant role in fostering student motivation and engagement.

Effects on Academic Performance

The application of AI in education has also been linked to improved academic performance. Gultom et al. (2024) reported that the use of the AI-based application Wordwall increased students' learning motivation from 48.25% to 85.8%. Moreover, Naila et al. (2023) found that AI-assisted learning tools improve students' independence, enthusiasm, persistence, and enjoyment in problem-solving. These studies indicate that AI tools like ChatGPT can contribute to better academic outcomes by supporting students' learning processes and developing essential skills.

Challenges and Considerations

Despite the potential benefits of AI in education, there are challenges and considerations that need to be addressed. Popenici and Kerr (2017) highlighted the importance of considering the ethical implications and limitations of current AI technologies. They argued that while AI can enhance personalization and adaptation in learning, it is crucial to maintain the central role of human educators and be aware of the potential risks, such as data privacy and algorithmic bias. Additionally, more research is needed to evaluate the long-term effects of AI tools on student learning and to develop evidence-based guidelines for their effective implementation (Okonkwo & Ade-Ibijola, 2021).

Conceptual Framework

Based on the literature review, the following conceptual framework is proposed for this study:

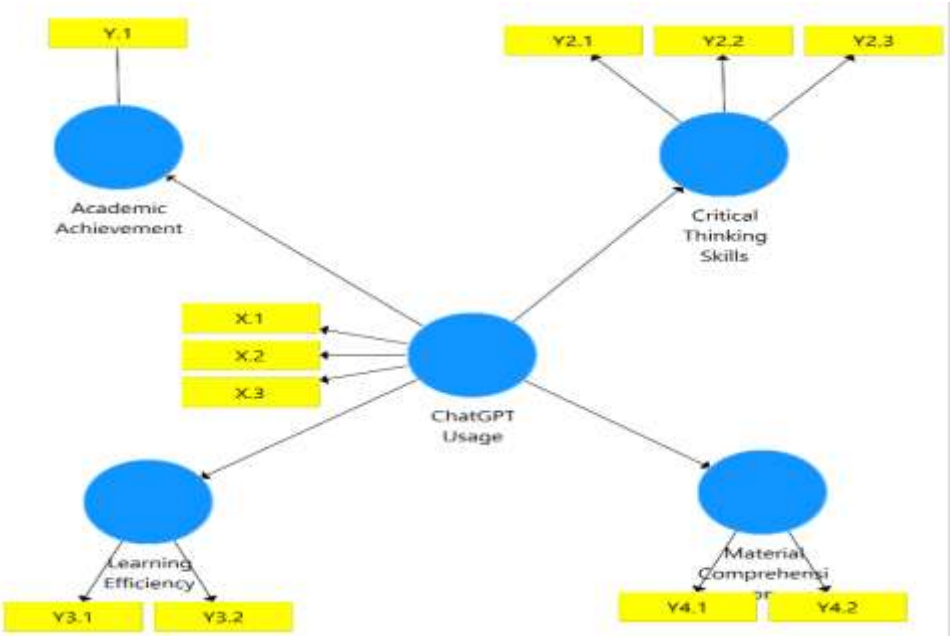

Figure 1. Conceptual Framework

Hypotheses:
H1: ChatGPT usage has a positive and significant effect on students' academic achievement.
H2: ChatGPT usage has a positive and significant effect on students' critical thinking skills.
H3: ChatGPT usage has a positive and significant effect on students' learning efficiency.
H4: ChatGPT usage has a positive and significant effect on students' material comprehension.

METHOD

Research Design

This study will employ a quantitative research approach with a cross-sectional survey design. The cross-sectional design allows for the collection of data at a single point in time, providing a snapshot of the current state of the variables under investigation (Creswell, 2014). This approach is suitable for examining the relationships between ChatGPT usage and the dependent variables of academic achievement, critical thinking skills, learning efficiency, and material comprehension among students in the Business Administration department at Politeknik Negeri Pontianak.

Population and Sample

The target population for this study consists of all active students in the Business Administration department at Politeknik Negeri Pontianak. A random sampling technique will be used to select a representative sample from this population. The sample size will be determined using the Slovin formula (Slovin, 1960), taking into account the desired level of precision and confidence level. The sample will be stratified based on student year levels to ensure proportional representation.

Data Collection

Data will be collected using an online survey questionnaire. The questionnaire will be developed based on the operationalization of the variables and will undergo pilot testing to ensure its validity and reliability. The questionnaire will consist of closed-ended questions using a Likert scale to measure the independent variable

(ChatGPT usage) and the dependent variables (academic achievement, critical thinking skills, learning efficiency, and material comprehension). Demographic questions will also be included to gather information about the respondents' characteristics.

Data Analysis

The collected data will be analyzed using descriptive and inferential statistics. Descriptive statistics, such as mean, standard deviation, and frequency distribution, will be used to summarize the demographic characteristics of the respondents and the levels of ChatGPT usage and the dependent variables.

Inferential statistics will be employed to test the hypothesized relationships between the variables. Multiple linear regression analysis will be conducted to examine the effect of ChatGPT usage on each of the dependent variables while controlling for relevant demographic factors. The significance level will be set at 0.05. The assumptions of multiple linear regression, including linearity, normality, homoscedasticity, and absence of multicollinearity, will be checked before running the analysis (Hair et al., 2014).

Partial Least Squares Structural Equation Modeling (PLS-SEM) will also be used to assess the overall fit of the proposed conceptual model and to estimate the path coefficients between the variables (Hair et al., 2017). The PLS-SEM approach is suitable for this study as it can handle complex models with multiple relationships and is robust to non-normality and small sample sizes.

Ethical Considerations

This study will adhere to ethical principles in research. Participation in the survey will be voluntary, and informed consent will be obtained from all respondents. The anonymity and confidentiality of the participants will be maintained throughout the research process. The study will seek approval from the relevant institutional review board before commencing data collection.

Limitations and Future Research

The cross-sectional design of this study limits the ability to establish causal relationships between the variables. Future research could employ longitudinal designs to investigate the long-term effects of ChatGPT usage on student learning outcomes. Additionally, qualitative research methods, such as interviews or focus group discussions, could provide deeper insights into students' experiences and perceptions regarding the use of AI tools in education.

RESULT NAD DISCUSSION

Data analysis was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to assess the impact of ChatGPT usage on various aspects of students' learning in the Business Administration department at Politeknik Negeri Pontianak. The results provide valuable insights into the relationships between the independent variable (ChatGPT usage) and the dependent variables (academic achievement, critical thinking skills, learning efficiency, and material comprehension).

Measurement Model Assessment

Before examining the structural relationships, the measurement model was evaluated to ensure the reliability and validity of the constructs. The outer loadings, which represent the relationships between each indicator and its corresponding construct, were assessed (see Table 1). All outer loadings were above the recommended threshold of 0.7 (Hair et al., 2017), indicating that

the indicators are reliable measures of their respective constructs.

Table 1. Outer Loadings

Indicators	Academic Achievement	ChatGPT Usage	Critical Thinking Skills	Learning Efficiency	Material Comprehension
X.1		0.914			
X.2		0.895			
X.3		0.793			
Y.1	1.000				
Y2.1			0.851		
Y2.2			0.863		
Y2.3			0.864		
Y3.1				0.924	
Y3.2				0.916	
Y4.1					0.908
Y4.2					0.939

The construct reliability and validity were further evaluated using Cronbach's alpha, composite reliability, and average variance extracted (AVE) (see Table 2). All values were above the recommended thresholds of 0.7 for Cronbach's alpha and composite reliability, and 0.5 for AVE (Hair et al., 2017), demonstrating the internal consistency and convergent validity of the constructs.

Table 2. Construct Reliability and Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Academic Achievement	1.000	1.000	1.000	1.000
ChatGPT Usage	0.835	0.836	0.902	0.755
Critical Thinking Skills	0.823	0.824	0.894	0.738
Learning Efficiency	0.819	0.821	0.917	0.847
Material Comprehension	0.830	0.852	0.921	0.853

Discriminant validity was assessed using the Fornell-Larcker criterion, cross-loadings, and the Heterotrait-Monotrait ratio (HTMT) (see Table 3). The square root of each construct's AVE was higher than its correlations with other constructs, and each indicator loaded highest on its corresponding construct, supporting discriminant validity (Fornell & Larcker, 1981). The HTMT values were below the conservative threshold of 0.85 (Henseler et al., 2015), further confirming the discriminant validity of the constructs.

Table 3. Discriminant Validity

Fornell-Larcker Criterion

Construct	Academic Achievement	ChatGPT Usage	Critical Thinking Skills	Learning Efficiency	Material Comprehension
Academic Achievement	1.000				
ChatGPT Usage	-0.102	0.869			
Critical Thinking Skills	0.012	0.654	0.859		
Learning Efficiency	-0.067	0.748	0.627	0.920	
Material Comprehension	-0.043	0.703	0.741	0.626	0.924

Cross Loadings

Indicators	Academic Achievement	ChatGPT Usage	Critical Thinking Skills	Learning Efficiency	Material Comprehension
X.1	-0.069	0.914	0.522	0.609	0.646
X.2	-0.003	0.895	0.601	0.649	0.635
X.3	-0.193	0.793	0.577	0.687	0.547
Y.1	1.000	-0.102	0.012	-0.067	-0.043
Y2.1	0.169	0.574	0.851	0.564	0.620
Y2.2	-0.089	0.573	0.863	0.496	0.670
Y2.3	-0.054	0.539	0.864	0.558	0.620
Y3.1	-0.057	0.704	0.568	0.924	0.580
Y3.2	-0.066	0.672	0.587	0.916	0.573
Y4.1	-0.061	0.581	0.694	0.521	0.908
Y4.2	-0.022	0.707	0.680	0.627	0.939

Structural Model Assessment

The structural model was evaluated to test the hypothesized relationships between ChatGPT usage and the dependent variables. The R-squared values (see Table 4) indicate the amount of variance in each dependent variable that is explained by ChatGPT usage. The results show that ChatGPT usage explains 42.8% of the variance in critical thinking skills, 56% in learning efficiency, and 49.4% in material comprehension. However, ChatGPT usage only explains 1% of the variance in academic achievement.

Table 4. R Square

Construct	R Square	R Square Adjusted
Academic Achievement	0,010	0,002
Critical Thinking Skills	0,428	0,423
Learning Efficiency	0,560	0,556
Material Comprehension	0,494	0,489

The f-squared values (see Table 5) provide insights into the effect size of ChatGPT usage on each dependent variable. According to Cohen's (1988) guidelines, f-squared values of 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes, respectively. ChatGPT usage has a large effect on critical thinking skills ($f^2 = 0.749$), learning efficiency ($f^2 = 1.271$), and material

comprehension (f^2 = 0.975), but a negligible effect on academic achievement (f^2 = 0.010)

Table 5. f Square

Construct	Academic Achievement	Critical Thinking Skills	Learning Efficiency	Material Comprehension
ChatGPT Usage	0.010	0.749	1.271	0.975

The path coefficients and their significance levels (see Table 6) reveal the strength and direction of the relationships between ChatGPT usage and the dependent variables. ChatGPT usage has significant positive effects on critical thinking skills (β = 0.654, p < 0.001), learning efficiency (β = 0.748, p < 0.001), and material comprehension (β = 0.703, p < 0.001). However, the effect of ChatGPT usage on academic achievement is not statistically significant (β = -0.102, p = 0.125).

Table 6. Path Coefficients

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
ChatGPT Usage -> Academic Achievement	-0,102	1,151	**0,125**
ChatGPT Usage -> Critical Thinking Skills	0,654	8,858	**0,000**
ChatGPT Usage -> Learning Efficiency	0,748	12,269	**0,000**
ChatGPT Usage -> Material Comprehension	0,703	12,072	**0,000**

Discussion

The results of this study provide valuable insights into the impact of ChatGPT usage on various aspects of students' learning in the Business Administration department at Politeknik Negeri Pontianak. The findings suggest that ChatGPT usage has significant positive effects on critical thinking skills, learning efficiency, and material comprehension, but not on academic achievement.

The strong positive relationship between ChatGPT usage and critical thinking skills aligns with previous research highlighting the potential of AI-powered tools to enhance higher-order thinking (Goel & Polepeddi, 2016; Okonkwo & Ade-Ibijola, 2021). ChatGPT's ability to provide instant feedback, engage in dialogue, and present multiple perspectives may stimulate students' critical thinking processes, such as analysis, evaluation, and synthesis.

Similarly, the significant positive effect of ChatGPT usage on learning efficiency supports the notion that AI-powered tools can streamline the learning process and help students manage their time and resources more effectively (Chen et al., 2020; Winkler & Söllner, 2018). ChatGPT's ability to provide personalized assistance, answer questions, and offer guidance may help students navigate complex topics more efficiently.

The positive relationship between ChatGPT usage and material comprehension suggests that ChatGPT

can serve as a valuable tool for clarifying concepts, providing explanations, and facilitating deeper understanding (Pérez et al., 2020; Smutny & Schreiberova, 2020). By engaging in interactive dialogue and offering contextual information, ChatGPT may help students grasp the nuances of the subject matter more effectively.

However, the lack of a significant relationship between ChatGPT usage and academic achievement raises important questions about the direct impact of AI tools on students' grades and overall performance. This finding may suggest that while ChatGPT can enhance various learning processes, its influence on academic outcomes is more complex and indirect. Factors such as individual differences, course design, and assessment methods may moderate the relationship between ChatGPT usage and academic achievement (Popenici & Kerr, 2017).

Implications and Future Research

The findings of this study have important implications for educators and educational institutions seeking to integrate AI tools like ChatGPT into their curricula. While ChatGPT shows promise in enhancing critical thinking, learning efficiency, and material comprehension, its impact on academic achievement remains unclear. Educators should carefully consider the specific goals and contexts of their courses when implementing ChatGPT and other AI tools.

Future research could explore the moderating factors that influence the relationship between ChatGPT usage and academic achievement, such as individual learning styles, prior knowledge, and course design. Additionally, qualitative studies could provide deeper insights into students' experiences and perceptions of using ChatGPT in their learning processes.

Longitudinal studies could also investigate the long-term effects of ChatGPT usage on students' learning outcomes and cognitive development. As AI tools continue to evolve and become more sophisticated, it is crucial to monitor their impact on education and adapt pedagogical approaches accordingly.

Limitations

This study has several limitations that should be considered when interpreting the results. First, the cross-sectional design limits the ability to establish causal relationships between the variables. Second, the sample was limited to students in the Business Administration department at a single institution, which may limit the generalizability of the findings to other contexts. Third, the study relied on self-reported data, which may be subject to biases and inaccuracies.

CONCLUSION

In conclusion, this study provides empirical evidence for the impact of ChatGPT usage on various aspects of students' learning in the Business Administration department at Politeknik Negeri Pontianak. The results highlight the potential of ChatGPT to enhance critical thinking skills, learning efficiency, and material comprehension, while also revealing the complexities surrounding its impact on academic achievement.

As AI tools like ChatGPT continue to evolve and become more prevalent in educational settings, it is crucial for educators and researchers to carefully examine their effects on student learning and adapt pedagogical approaches accordingly. By leveraging the strengths of AI while addressing its limitations, we

can harness the power of technology to support and enhance the learning experiences of students in the 21st century.

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