

A Confirmatory Study on the Impact of ChatGPT Utilization on Critical Thinking Skills and Learning Motivation Among Jambi University Students

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HOW TO CITE:

Firman, Friscilla Wulan Tersta, Hidayatul Arief, Mar'Atun Sholiha, Amir Syarifuddin, Risdalina (2026). A Confirmatory Study on the Impact of ChatGPT Utilization on Critical Thinking Skills and Learning Motivation Among Jambi University Students.

International Journal of Special Education, 41(11s), 220-230

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ABSTRACT:

The advent of generative artificial intelligence technologies, exemplified by ChatGPT, has instigated substantial changes in the learning process within higher education. This study seeks to ascertain the effect of ChatGPT utilization on the critical thinking abilities and learning motivation of students at the University of Jambi. This study employs a quantitative methodology utilizing a confirmatory model grounded in Covariance-Based Structural Equation Modeling (CB-SEM). The research sample comprised 2,027 fifth-semester undergraduate students selected using convenience sampling. The research model satisfied the goodness of fit requirements, indicating that the utilization of ChatGPT positively and significantly influenced students' critical thinking skills. The impact of ChatGPT utilization on learning motivation was negligible. The findings suggest that ChatGPT can function as a learning tool that fosters the development of higher-order thinking skills, although it does not inherently enhance students' learning motivation. This study offers empirical insights into the use of AI technology in higher education, specifically about the efficacy of ChatGPT in enhancing the quality of the learning experience for students.

Keywords: ChatGPT; Critical Thinking; Learning Motivation.

1. INTRODUCTION

The emergence of generative artificial intelligence technologies such as ChatGPT at the end of 2022 has brought significant changes to the world of higher education. ChatGPT, launched by OpenAI in November 2022, immediately attracted widespread attention due to its ability to answer questions and interact in natural language (Wang & Fan, 2025). In a short period of time, this large language model-based chatbot was adopted by many students as a revolutionary "learning companion" to assist with independent learning (Atieku-Boateng et al., 2024).

A recent global survey of 23,218 students from various countries shows that 71% of college students have tried using ChatGPT in its first year of existence, and the majority of these students find ChatGPT interesting to use and believe that this tool can improve their general knowledge (Ravšelj et al., 2025). Furthermore, ChatGPT is used for various academic purposes, such as completing college assignments, searching for research references, and even studying new topics independently (Atieku-Boateng et al., 2024). This shows that generative AI has changed students' access to information and

provided a responsive learning companion. However, behind all this, the integration of generative AI into the educational environment is still a subject of debate among academics regarding its potential benefits and challenges (Nemt-allah et al., 2024).

Many recent studies have begun to explore the impact of ChatGPT use on the learning process of students. A number of preliminary studies have reported positive findings, with ChatGPT being assessed as capable of improving student learning performance and critical thinking skills (Guo & Lee, 2023; Parsakia, 2023; Qawqzeh, 2024; Zhou & Li, 2023). For example, an experimental study in higher education shows that integrating ChatGPT into coursework significantly improves students' ability to ask in-depth questions, analyze information, and understand complex concepts (Guo & Lee, 2023). Similar findings were reported in the context of debate learning, where the use of ChatGPT was found to significantly improve students' conceptual understanding, critical thinking, and argumentation skills compared to traditional debate methods (de la Puente et al., 2024). This indicates that AI chatbots can serve as effective tools for training higher-order thinking skills in higher education.

Beyond cognitive impacts, ChatGPT also offers opportunities in affective and learning engagement aspects. Several previous studies have confirmed the positive impact of ChatGPT use in increasing student learning motivation (Costa et al., 2024; Shoufan, 2023; Yin et al., 2021; Zhou & Li, 2023). The use of this technology enables the transformation of teaching into a more interactive and personalized process, motivating students to actively participate in the learning process (Costa et al., 2024; Shoufan, 2023). From a more psychological perspective, a study based on Self-Determination Theory (SDT), specifically in learning using ChatGPT, found that the use of ChatGPT can increase perceived choice (autonomy), perceived competence, perceived value, and reduce pressure -tension (autonomy), which ultimately increases interest and enjoyment, reflecting learning motivation (Yin et al., 2021).

However, behind some positive benefits, there is a risk that over-reliance on AI could undermine the

development of students' analytical skills. Research conducted by (Gerlich, 2025) shows that individuals who rely too heavily on AI to perform analytical tasks may become less proficient at conducting in-depth and independent analysis. This dependence can lead to a superficial understanding of information and reduce the capacity for critical analysis. Furthermore, (Fuchs, 2023; Khurma et al., 2024; Vieriu & Petrea, 2025) found that dependence on ChatGPT causes students to become passive learners and potentially hinders the development of their critical thinking skills. Furthermore, a systematic literature review found that the use of ChatGPT also has a negative impact on learning motivation, such as causing laziness to learn (Supriyono et al., 2024). A meta-analysis and systematic review of the effects of chatbot technology use in continuing education also showed that chatbot technology use cannot significantly increase learning motivation (Deng & Yu, 2023). Furthermore, an experimental study (Fan et al., 2024) also found that there was no difference in the intrinsic motivation of students who used ChatGPT in learning compared to those who did not.

Critical thinking skills reflect the quality of students' information processing and problem-solving; learning motivation reflects the internal drive that influences the intensity of effort and persistence in learning. The development of AI such as ChatGPT has the potential to influence both of these aspects simultaneously: for example, instant feedback from ChatGPT can increase motivation, which in turn encourages students to be more active in independent learning and critical thinking practice, or conversely, the ease of instant answers can weaken critical thinking practice and independence if not balanced with a reflective attitude. By examining these variables simultaneously, this study aims to provide a comprehensive picture of the impact of ChatGPT use on the quality of the learning process for students at the University of Jambi.

2. METHOD

A quantitative approach was used in this study using a confirmatory model through covariance-based structural equation modeling (CB-SEM). CB-SEM was chosen because this study already had a

theoretical framework and sought to confirm the proposed model. SEM is a confirmatory multivariate analysis method that comprehensively tests the fit of latent variable measurement models using confirmatory factor analysis (CFA) (Hair et al.,

2019). Using this approach, this study aims to confirm the effect of ChatGPT on students' critical thinking skills and learning motivation. The model proposed in this study is as follows.

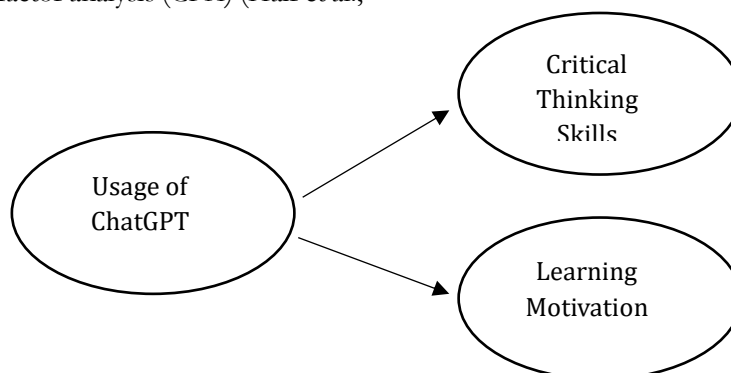


Figure 1. Conceptual Model of Research

The sample in this study consisted of undergraduate students at the University of Jambi who were in their fifth semester. The basis for considering students at this semester level as the population was that, first, they had generally completed basic courses and the transition stage from high school to college. They already had experience with independent learning in a campus environment and were accustomed to both online and offline learning systems. Second, various studies show that active ChatGPT users among students are those in their second or third year of college, which is synonymous with the fifth semester (Atieku-Boateng et al., 2024; Vieriu & Petrea, 2025; Zhou & Li, 2023). They are at the peak of their interaction with technology, but are not yet fully under the pressure of writing a thesis or final project, so they are more exploratory in their use of AI.

The sampling technique used in this study was convenience sampling, which is a sampling

technique where the samples used in the study are based on the availability of samples obtained and the samples obtained are deemed suitable for the characteristics of the sample that have been determined (Septiani et al., 2020). The research instrument was provided in the form of a self-administered questionnaire using Google Forms, which was distributed to participants via WhatsApp during July-October 2025. In the questionnaire provided, participants were asked to maintain the confidentiality of their identities and were informed that this research was for academic purposes only. From the questionnaire distribution, 2027 data were obtained from students from various faculties at the University of Jambi, where the majority of respondents were female and almost all of them had participated in project-based learning or case studies in their respective study programs. Table 1 below details the demographic characteristics of the respondents.

Table 1. Research Sample Demographics

Characteristics	Total (n=2027)	Percentage (%)
Gender		
Male	650	32%
Female	1377	68%
Faculties	2027	
Economics and Business	745	37%

Medicine and Health Sciences	125	6%
Teaching and Education	670	33%
Law	157	8%
Agriculture	174	9%
Animal Husbandry	64	3%
Science and Technology	92	5%
Classroom Learning Methods		
Project-Based Learning/Case Studies	1800	89%
Lectures	17	1%
Group Discussions	185	9%
Simulations	25	1%

To avoid measurement errors, all scales used to measure constructs in this study were adopted from previous studies. The scale used to measure ChatGPT usage in this study was developed by (Nemt-allah et al., 2024) and consists of 15 measurement items based on three dimensions: Academic Writing Assistance, Academic Task Support, and Dependence and Trust. All items are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). To measure the construct of critical thinking ability in this study, a scale developed by (Khoiriyah et al., 2015) consisting of 15 measurement items was used. The original scale was measured using a 7-point Likert scale, ranging from 1 (not very true for me) to 7 (very true for me). However, in this study, the statements were measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The last construct in this study, learning motivation, was measured using an intrinsic motivation scale originally developed by (Ryan & Deci, 2000), in which intrinsic motivation is considered to be interest and enjoyment because someone who is intrinsically motivated learns because they are interested in the material and enjoy the learning process. In this study, the scale used was adapted from the scale developed by (Yin et al., 2021), which consists of seven items. In the measurement, a seven-point Likert scale was used with answers ranging from strongly disagree to

strongly agree. However, in this study, a five-point Likert scale was used with 1 (strongly disagree) and 5 (strongly agree).

The data analysis technique used in this study is a structural equation model consisting of two stages recommended by (Hair et al., 2019) used to estimate the proposed conceptual model and test hypotheses. The first stage is the evaluation of the measurement model, which estimates confirmatory factor analysis, validity, and reliability. To determine construct reliability, Cronbach's alpha and composite reliability (CR) were used. Construct validity was evaluated using the factor loading of each item measured and the average variance extracted (AVE). Discriminant validity was evaluated using the Fornell-Larcker criteria (Fornell & Larcker, 1981). In the second stage, after the measurement model was deemed acceptable, structural model analysis was conducted to test the causal relationships between constructs. Path coefficients were estimated and tested for significance (t or p values). Parameters such as R^2 values in endogenous constructs were analyzed to determine the strength and contribution of exogenous variables. Hypotheses were tested based on the statistical significance of the paths and the direction of the hypothesized relationships. If a path is not significant, it can be considered for removal in subsequent model modifications. The final step in the analysis is to evaluate the model fit using various

goodness-of-fit indices. This stage includes examining the Chi-square (χ^2 , expected to be insignificant), the degrees of freedom ratio ($\chi^2/df < 3.0$), Root Mean Square Error of Approximation ($RMSEA \leq 0.08$), Standardized Root Mean Residual ($SRMR < 0.08$) Comparative Fit Index ($CFI \geq 0.92$), Tucker-Lewis Index ($TLI \geq 0.92$). The model is considered a good fit if most of the criteria are met.

3. RESULT AND DISCUSSION

Result

Evaluation of Measurement Model

After determining that the multivariate data is normally distributed, as can be seen from the Skewness value between -1.96 and 1.96, the first step in data analysis in this study is to ensure that the measurement model used is valid and reliable. In this case, confirmatory factor analysis is performed to ensure this. Cronbach's alpha, CR, AVE, and factor loading are used as parameters in this measurement. The internal consistency and reliability of each variable were evaluated by calculating Cronbach's

alpha, while CR was used to measure internal consistency by considering the item factor loading value (Hair et al., 2019). Similarly, AVE was used to evaluate convergent validity, and factor loading showed the degree and relevance of the relationship between items and variables. The statistical results show that all variables have a Cronbach's alpha of more than and a CR value of more than 0.7. Therefore, the reliability of the internal consistency of this scale is adequate for analysis. In addition, the AVE values of all variables exceed the threshold of 0.50, confirming convergent validity (Hair et al., 2019). Furthermore, for the factor loadings of each item, several items with factor loadings less than 0.5 were discarded in this study (LM6, LM7), and those retained were items with factor loading values ranging from 0.604 to 0.856 for 28 items, indicating a substantial relationship between the items and their respective constructs (Hair et al., 2019). In detail, the results of the validity and reliability evaluation of the measurement model can be seen in Table 2 below.

Table 2. Construct Validity and Reliability

Variable	Name	Mean	Standard deviation	Skewness	Cronbach' alpha	CR	AVE	Factor loading
Usage of ChatGPT	GPT1	3.595	0.844	-0.796	0.947	0.947	0.546	0.738
	GPT2	3.596	0.833	-0.814				0.760
	GPT3	3.569	0.843	-0.671				0.768
	GPT4	3.358	0.888	-0.409				0.733
	GPT5	3.407	0.922	-0.503				0.681
	GPT6	3.533	0.863	-0.578				0.793
	GPT7	3.633	0.843	-0.751				0.793
	GPT8	3.218	0.85	-0.252				0.697
	GPT9	3.529	0.836	-0.622				0.794
	GPT10	3.454	0.844	-0.473				0.781
	GPT11	3.499	0.854	-0.597				0.772
	GPT12	3.687	0.919	-0.509				0.665
	GPT13	3.094	0.823	-0.133				0.604
	GPT14	3.558	0.812	-0.634				0.779

	GPT15	3.317	0.861	-0.18				0.699
	CTS1	3.609	0.748	-0.499				0.776
	CTS2	3.708	0.74	-0.62				0.824
	CTS3	3.751	0.819	-0.707				0.716
Critical Thinking Skills	CTS4	3.668	0.756	-0.603				0.819
	CTS5	3.758	0.737	-0.606	0.937	0.937	0.653	0.856
	CTS6	3.753	0.752	-0.658				0.840
	CTS7	3.734	0.745	-0.593				0.816
	CTS8	3.621	0.736	-0.417				0.811
	LM1	3.523	0.736	-0.349				0.780
	LM2	3.583	0.721	-0.428				0.812
Learning Motivation	LM3	3.562	0.73	-0.353	0.902	0.902	0.649	0.826
	LM4	3.569	0.756	-0.313				0.808
	LM5	3.532	0.723	-0.199				0.801

In addition, this study also estimates discriminant validity based on the Fornell-Larcker criteria (Fornell & Larcker, 1981; Hair et al., 2019). The root mean square error must be greater than the maximum correlation with other constructs and

greater than 0.7 to ensure discriminant validity. The statistical output shows values greater than the correlation between other latent variables (see bold marks). Therefore, this model is declared to meet the requirements for discriminant validity.

Table 3. Discriminant Validity

	Critical Thinking Skills	Intrinsic Motivation	Usage of ChatGPT
Critical Thinking Skills	0.808		
Learning Motivation	-0.027	0.806	
Usage of ChatGPT	0.633	-0.019	0.739

The final step in evaluating the measurement model before conducting hypothesis testing is to examine the model fit as recommended by (Hair et al., 2019). Based on the results of confirmatory factor analysis

shown in Table 4, the suitability of the research model is acceptable with a P value of 0.000, RMSEA = 0.060, SRMR = 0.038, CFI = 0.936, TLI = 0.931.

Tabel 4. Summary of Model Fit Measurement

Fit Model	Threshold	Measurement Model
P value	0.000	0.000
RMSEA	<0.07	0.060
SRMR	<0.08	0.038
TLI	>0.92	0.931

CFI	>0.92	0.936
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Hypothesis Testing and Structural Models

The significance of the hypothesized relationship was tested based on the path coefficient ($p < 0.05$). As can be seen in Table 5, the results show that the

usage of ChatGPT in learning positively affects students' critical thinking skills ($\beta = 0.633$, $t = 22.418$, $p = 0.000$).

Table 5. Hypothesis Testing Results

Path Relationship	Path Coefficients	T Value	P values	Decision
GPT -> CTS	0.633	15.937	0.000	Supported
GPT -> LM	-0.020	0.900	0.369	Not Supported

Note: GPT = Usage of ChatGPT, CTS= Critical Thinking Skills, LM = Learning Motivation

Furthermore, based on the analysis results, it can also be seen that the use of ChatGPT in learning does not affect student learning motivation ($\beta = -0.020$, $t = 0.900$, $p = 0.368$). When looking at the coefficient value of ChatGPT use on learning motivation, it shows a negative number, which

means that the use of ChatGPT in learning will reduce student learning motivation, although not significantly. Then, based on the explanatory ability of the model as shown in Figure 2, critical thinking ability can be explained by the use of ChatGPT by 40%.

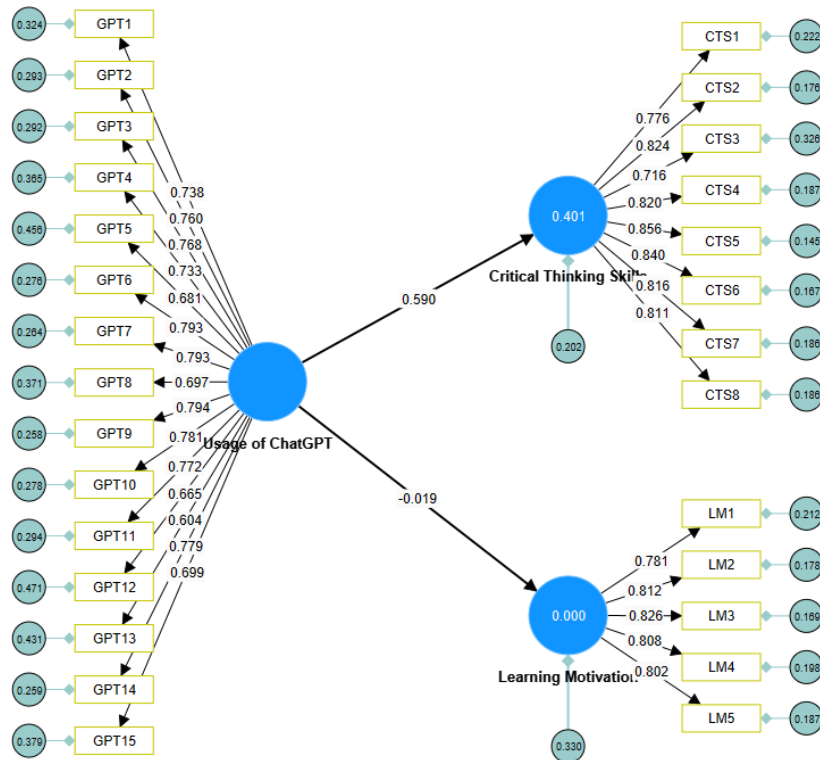


Figure 2. Results of The Research Model Tests

Discussion

The results of this study confirm two findings. The first is that the use of ChatGPT in learning by students at the University of Jambi will improve their critical thinking skills. As a learning tool, ChatGPT provides instant feedback and

information sources that help students fill gaps in their understanding, stimulate curiosity, and encourage the exploration of new ideas (Bettayeb et al., 2024; Hasanein & Sobaih, 2023). Furthermore, findings (Costa et al., 2024) report that when students are encouraged to use ChatGPT critically

by comparing AI answers with literature, they will understand that using ChatGPT requires critical and ethical thinking, and some of them successfully develop critical thinking competencies during the task. These research findings confirm the findings of several empirical studies that support the potential for improving critical thinking skills through ChatGPT. For example, a study conducted by (de la Puente et al., 2024) reported that students who participated in debate sessions with ChatGPT support showed significant improvements in their understanding of complex concepts, critical thinking, and argumentation skills compared to the traditional control group. An experimental study conducted by (Essel et al., 2024) also found that the post-test critical thinking scores of students who used ChatGPT were significantly better than those of the control group. Furthermore, a recent meta-analysis by (Wang & Fan, 2025) concluded that, overall, ChatGPT has a moderate positive impact on the development of students' higher-order thinking, although its influence varies depending on the method of use and the context of the course. These findings indicate that, when integrated with appropriate learning designs, ChatGPT can function as a cognitive balancer that enriches students' critical thinking skills (Suriano et al., 2025; Wang & Fan, 2025).

The second finding of this study shows that the use of ChatGPT in learning does not increase student motivation, but rather tends to decrease it. This finding contradicts several previous studies that found that ChatGPT can provide a more interactive learning experience and increase academic confidence. As found by (Khurma et al., 2024) in their systematic review, ChatGPT encourages student motivation by providing personalized guidance, support, and feedback. In essence, ChatGPT can facilitate the need for autonomy and competence through individual guidance, so that students are more motivated to engage in learning. Similar findings were also reported by (Huang et al., 2025), who found that overall student interaction with ChatGPT was positively correlated with learning motivation. Additionally, in an SDT-based study, students' perceptions of autonomy and connectedness related to ChatGPT use were significant determinants of their motivation to

continue using ChatGPT in learning. In other words, when students feel more autonomous and connected through ChatGPT, their learning motivation tends to increase (Annamalai & Nasor, 2025). However, the results of this study are in line with the literature that highlights the negative side of AI use in learning. A study on the use of ChatGPT in learning highlights that continuous use can cause students to lose motivation to learn because they become accustomed to getting instant answers without meaningful cognitive effort (Morales et al., 2023). Furthermore, (Sun et al., 2024) report that over-reliance on ChatGPT can reduce student engagement in learning. This is because instead of completing assignments independently, they prefer to copy and paste to complete every task in their learning. (Lo et al., 2024) adds that excessive use of ChatGPT can reduce positive emotional attitudes toward learning and weaken students' independent thinking skills.

Although ChatGPT has been proven to improve students' critical thinking skills, the finding that the use of ChatGPT does not significantly affect learning motivation and even leads to negative tendencies needs to be taken seriously by educators, curriculum designers, and higher education policymakers. This finding indicates that the integration of AI technology in learning cannot be done mechanically or simply by following trends. Lecturers and institutions need to design learning strategies that combine the use of ChatGPT with pedagogical approaches that support the fulfillment of students' psychological needs. When students only act as passive users of technology without active involvement in the thinking process, their learning motivation is at risk of declining. Furthermore, the effectiveness of AI use is greatly influenced by instructional design, learning context, and students' digital literacy. These findings expand the empirical understanding of the impact of AI use in higher education and highlight the importance of pedagogical guidance to ensure that technology truly supports learning motivation and engagement.

As with all studies, this study was not without limitations. First, the scope of research participants was limited to students from one university, namely the University of Jambi, which, despite having a

diverse faculty background, did not reflect the heterogeneity of students at the national and international levels. The context of specific institutions, local academic cultures, and the level of technological readiness of each study program can influence how students interpret and use ChatGPT, including its impact on learning motivation. Second, the measurement of learning motivation was conducted through an intrinsic scale that was self-reported, which was highly dependent on the subjective perceptions of the respondents. Although the measurement tools used have been validated, the use of questionnaire-based quantitative data still has limitations in capturing the complex emotional, cognitive, and social nuances of learning motivation. Third, this study used a non-experimental design with a confirmatory CB-SEM approach, which allows for the analysis of relationships between variables but cannot reveal definite cause-and-effect relationships. Therefore, although it was found that the use of ChatGPT did not have a significant effect on learning motivation, this finding cannot be directly concluded as a causal relationship without considering other variables that may moderate or mediate this effect, such as learning strategies, learning styles, or perceptions of technology. Finally, data collection was conducted within a specific period, namely between July and October 2025. This did not allow researchers to capture the dynamics of longitudinal changes in motivation. Students' learning motivation can change over time depending on academic, social, or technological factors, so studies with a cross-sectional approach such as this cannot capture the process of change.

4. CONCLUSION

This study concludes that the use of ChatGPT in learning among students at the University of Jambi has different effects on two main aspects of the learning process, namely critical thinking skills and learning motivation. On the positive side, ChatGPT has been proven to improve students' critical thinking skills, as reflected in their increased ability to analyze information, ask in-depth questions, and evaluate arguments. These findings indicate that ChatGPT can serve as an effective cognitive aid in developing higher-order thinking skills, especially when used reflectively and purposefully. However, on the other hand, this study also found that the use of ChatGPT did not increase students' learning motivation and even showed a negative trend. Students tend to become more passive, less emotionally engaged, and rely on technology to complete tasks without sufficient cognitive involvement. This indicates that the use of ChatGPT in learning, without proper pedagogical support and adequate AI literacy, has the potential to reduce students' intrinsic motivation to learn independently and deeply. Thus, it can be concluded that although ChatGPT has the potential to strengthen the cognitive aspects of learning, its application must be carefully designed so as not to weaken students' motivational aspects. The use of ChatGPT needs to be accompanied by learning strategies that emphasize reflective thinking, the development of learning autonomy, and ethical understanding so that this technology truly supports the holistic learning process.

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