

## The Use of ChatGPT and Student Learning Motivation: A Self-Determination Theory Perspective

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### Abstract

The use of ChatGPT is increasingly widespread in higher education, but previous research has shown inconsistent impacts on students' learning processes and motivation. This indicates the need for more in-depth studies on how this technology influences the psychological aspects underlying learning motivation. This study aims to analyze the effect of ChatGPT use on students' learning motivation through four main predictors within the Self-Determination Theory (SDT) framework: stress-strain, perceived choice, perceived competence, and perceived value. A quantitative approach was used with a variance-based Structural Equation Modeling (PLS-SEM) design. A total of 2,027 fifth-semester students at the University of Jambi participated in this study by completing a 5-point Likert-scale questionnaire adapted from previous instruments. The analysis showed that ChatGPT use significantly affected all predictors of learning motivation. ChatGPT use reduced tension-pressure and positively increased perceived choice, perceived competence, and perceived value. These findings indicate that ChatGPT plays a role as a learning aid that can meet students' needs for autonomy, competence, and perceived value, thus potentially strengthening their learning motivation. Practically, the results of this study recommend the integration of ChatGPT in learning as support for independent learning and improving academic understanding, accompanied by appropriate AI literacy policies.

**Keywords:** chatgpt; learning; motivation

### Cite This Article

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## INTRODUCTION

The development of ChatGPT as a generative artificial intelligence technology has reached various aspects of higher education globally. ChatGPT was introduced in late 2022 and quickly became popular among students and educators for academic tasks such as writing texts, research, and completing coursework (1–3). For example, (1) stated that ChatGPT is widely used to generate academic content and answer questions, making it an effective learning resource for students. Furthermore, a meta-analysis conducted by (4) showed that the use of ChatGPT tends to improve student learning performance with a large positive effect on learning achievement and moderate effects on learning perceptions and higher-order thinking skills. However, literature findings are mixed: some studies report neutral or negative impacts of ChatGPT on student learning performance (5–8). This disagreement highlights the need for an in-depth analysis of how ChatGPT impacts student learning motivation.

Student learning motivation is a key factor in academic success, and current psychological theory emphasizes the role of basic psychological needs (9). Deci and Ryan's Self-Determination Theory states that every individual has three primary psychological needs: autonomy (freedom of choice), competence (a sense of competence), and relatedness or relatedness (a sense of connection with others) (10). Fulfilling these three needs increases students' intrinsic motivation, engagement, and persistence in learning. Therefore, it is important to examine how the integration of ChatGPT into the learning process interacts with the fulfillment of students' needs for autonomy, competence, and relatedness. In other words, the Self-Determination Theory (SDT) perspective is a relevant theoretical framework for understanding both the positive and negative effects of ChatGPT on learning motivation.

Several preliminary studies have linked ChatGPT to the SDT framework in educational contexts. (11) found that students' use of ChatGPT can increase their sense of autonomy in self-directed learning, for example by reducing social anxiety and increasing readiness to face professional challenges. Furthermore, (10) used SDT to model students' motivation for long-term ChatGPT use. They reported that initial use of ChatGPT increased students' perceptions of autonomy, competence, and connectedness to the learning process. In this study, both autonomy and relatedness were predicted to contribute to students' sense of competence in using ChatGPT, and both needs were key determinants of students' motivation to continue using ChatGPT. These findings confirm the key role of autonomy and social relatedness in mediating the relationship between ChatGPT use and learning motivation.

Overall, the literature indicates several potential influences of ChatGPT on students' learning motivation. From an autonomy perspective, ChatGPT enables more independent and flexible learning. Most students felt they could control their learning pace when using ChatGPT (10). ChatGPT also helped students generate ideas and self-direct learning projects, thus encouraging independent thinking and autonomous empowerment in learning (11). This is consistent with findings (10) that reported ChatGPT plays a role in promoting independent learning. In terms of competency, ChatGPT can strengthen understanding of course material. Survey results showed that most students agreed that ChatGPT was able to answer questions and explain course concepts effectively (10). Furthermore, study participants noted that ChatGPT helped work through technical problems, refine ideas, and explain complex material in an accessible style (12). They even found that students who received ChatGPT-integrated instruction significantly improved their research skills; this improvement was mediated by higher autonomous motivation (12). The results of a meta-analysis (4)

also support a positive effect on competence: they reported that the use of ChatGPT significantly improved students' overall academic performance.

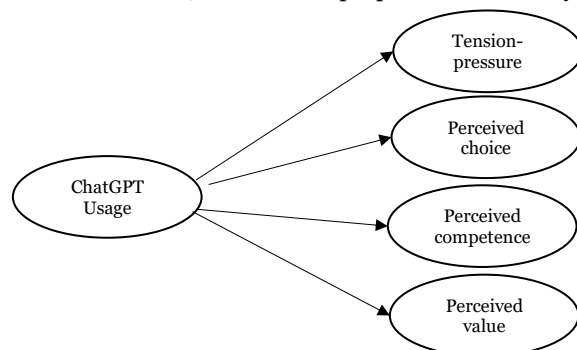
On the other hand, ChatGPT usage also has a negative impact on student learning motivation. Excessive use of ChatGPT can encourage negative tendencies such as procrastination and decreased memory (1). They stated that students who use ChatGPT tend to procrastinate more often and experience a decline in long-term memory quality, which in turn lowers their academic performance. Furthermore, several studies show that ChatGPT does not always improve learning; some even find that ChatGPT has no significant effect or even hinders students' long-term academic performance (13–16). In terms of SDT, ChatGPT also has limitations. Although it can reduce social anxiety, ChatGPT lacks emotional intelligence and cannot fully replace human interaction. Many students stated that ChatGPT cannot fully meet relationship needs because it cannot mimic social validation and empathy (13). Furthermore, some students felt uncomfortable handing over the learning decision-making process entirely to ChatGPT (10), suggesting limitations in autonomy support if learning control is too dependent on the machine. Another concern raised by researchers is the potential for ChatGPT to undermine academic integrity, which could negatively impact students' intrinsic motivation (1).

Thus, the use of ChatGPT in higher learning offers opportunities to increase motivation through the fulfillment of student autonomy and competence, but also raises challenges that can hinder motivation if not managed properly. Therefore, this study aims to comprehensively explore how ChatGPT can be integrated into the learning process to support the needs of autonomy, competence, and student relationships and the results of this study are expected to provide a comprehensive picture of the impact of ChatGPT use on the quality of the student learning process through the Self-Determination Theory approach.

## METHODS

### *Study design and setting*

A quantitative approach was used in this study with the aim of producing a model through variance-based Structural Equation Modeling (SEM) (VB-SEM). VB-SEM was chosen because this study attempts to develop a theoretical model of how the use of ChatGPT in learning can improve student learning motivation. The main concept of VB-SEM involves building a model with latent variables (constructs) measured through their indicators, then calculating the direct and indirect influence paths between these variables (17). The model proposed in this study is as follows.



**Figure 1.** Research Model

### ***Population, samples and sampling***

The population of this study was undergraduate students at the University of Jambi in their fifth semester. Students at this semester level were selected because, first, they have generally completed basic courses and are in the transition from high school to college. They have had experience with independent learning on campus and are familiar with both online and offline learning systems. Second, various studies have shown that active ChatGPT users among students are those in their second or third year of college, which corresponds to their fifth semester (9,18). They are at their peak interaction with technology but are not yet fully under the pressure of writing a thesis or final project, making them more exploratory in their use of AI. The sampling technique used in this study was convenience sampling, a sampling technique where the samples used in this study were based on the availability of samples obtained and the samples obtained were deemed suitable for the predetermined sample characteristics (19). The data collection yielded 2,027 students from various faculties at the University of Jambi, with the majority of respondents being female and almost all of them having undertaken project-based learning or case studies in their respective study programs. Table 1 below details the demographics of the respondents.

**Table 1.** Demographic characteristics of the respondents

Characteristics	Total (n=2027)	Percentage (%)
<i>Gender</i>		
Male	650	32%
Female	1377	68%
<i>Faculties</i>		
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%
<i>Classroom Learning Methods</i>		
Project-Based Learning/Case Studies	1800	89%
Lectures	17	1%
Group Discussions	185	9%
Simulations	25	1%

### ***Instruments, criteria, procedure and data collection***

The questionnaire is the measurement instrument used in this study. Each questionnaire used for each construct is adopted from a questionnaire that has been developed and used in previous studies. Each variable is measured by a 5-point Likert scale questionnaire with answer options ranging from 1 (strongly disagree) to 5 (strongly agree). The scale used for each variable was adopted and adapted from previous research and literature reviews in accordance with the Indonesian context. The scale used in measuring the use of ChatGPT in this study uses a scale developed by

(20) consists of 15 measurement items based on three dimensions: Academic Writing Assistance, Academic Task Support, and Dependence and Trust. The self-determination theory (SDT) approach is used as the basis for measuring learning motivation in this study. SDT states that humans have three basic psychological needs: autonomy, competence, and relatedness (21). The scale used is adapted from a scale developed by (11) which uses the same framework. Where they stated that there are four main predictors that determine student learning motivation, namely perceived choice and perceived competence function as positive predictors of intrinsic motivation and include four and five items, respectively. Tension-pressure is a negative predictor of intrinsic motivation consisting of five items. Perceived value reflects internalization and self-regulation when people experience useful activities, and this scale includes four items. The research instrument was administered in the form of a self-completed 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.

**Statistical analysis**

In this study using the Structural Equation Modeling Partial Least Squares (SEM-PLS) data analysis technique with SmartPLS version 4.0. This study adopts the analysis steps recommended by (17) which consists of 2 stages of analysis. The first stage is the evaluation of the measurement model by fulfilling 4 measurement criteria, namely Reflective indicator loadings, Internal Consistency reliability, Convergent validity, Discriminant validity. Then the second stage is the evaluation of the structural model which consists of testing multicollinearity between variables, measuring the magnitude of the path coefficient and p value as the basis for proving the hypothesis. After that, test the model's ability to explain ( $R^2$  and  $f^2$ ) and finally test the model's ability to predict (PLSpredict).

**RESULTS**

*Evaluation of Measurement Model*

The first step in Partial Least Square- Structural Equation Modeling (PLS-SEM) analysis is to meet the valid and reliable criteria for the measurement model used. Standard criteria for convergent validity are required if the value of the loading factor of all constructs  $> 0.60$  and  $AVE > 0.5$  (17). the results obtained from data analysis show that the loading factor value of all items and the AVE value have met the criteria for convergent validity. Then for internal consistency reliability, the value of Cronbach's Alpha and Composite Reliability of all constructs  $> 70$ , which means that the reliability of the measurement model in this study has met the criteria. In detail, the results of the measurement model evaluation in this study can be seen in table 2.

**Table 2.** Measurement Validity and Reliability

Laten Variable	Indicators	Convergent Validity		Internal Consistency Reliability	
		Loading	AVE	Cronbach's Alpha	Composite Reliability
ChatGPT Usage	GPT1	0.752	0.576	0.947	0.949
	GPT2	0.773			
	GPT3	0.780			

	GPT5	0.754			
	GPT6	0.707			
	GPT7	0.808			
	GPT8	0.805			
	GPT9	0.724			
	GPT10	0.807			
	GPT11	0.801			
	GPT12	0.791			
	GPT13	0.690			
	GPT14	0.640			
	GPT15	0.798			
	GPT16	0.729			
Tension-pressure	TP1	0.925			
	TP3	0.917	0.849	0.822	0.823
Perceived Choice	PCH1	0.930			
	PCH2	0.935	0.869	0.850	0.851
Perceived competence	PCT1	0.690			
	PCT2	0.640			
	PCT3	0.798	0.728	0.906	0.912
	PCT4	0.729			
Perceived value	PV1	0.900			
	PV2	0.915			
	PV3	0.912	0.814	0.924	0.924
	PV4	0.881			

This study also evaluates discriminant validity using the Heterotrait-Monotrait Ratio (HTMT) value. The relevant HTMT threshold value recommended is 0.9 (17). The results of data analysis in this study show that the HTMT value of all constructs is below 0.9, which means that the criteria for discriminant validity have also been met in this study. The HTMT values for all constructs can be seen in table 3 below.

**Table 3.** Discriminant Validity Using HTMT

	Heterotrait-monotrait ratio (HTMT)
Perceived value <-> Perceived competence	0.869
ChatGPT Usage <-> Perceived competence	0.545
ChatGPT Usage <-> Perceived value	0.529
Perceived choice <-> Perceived competence	0.849
Perceived choice <-> Perceived value	0.833
Perceived choice <-> ChatGPT Usage	0.574
Tension-pressure <-> Perceived competence	0.783
Tension-pressure <-> Perceived value	0.748
Tension-pressure <-> ChatGPT Usage	0.543
Tension-pressure <-> Perceived choice	0.786

*Evaluation of the Structural Model*

The first step in evaluating the structural model carried out in this study tests for multicollinearity symptoms using the variance inflation factor (VIF) value to show the significance of the correlation between constructs. It can be seen in table 3 that the VIF value in this study has met the criteria that the correlation between constructs is all at a value of <3 (17), which means there are no symptoms of multicollinearity.

**Table 4.** Variance inflation factor (VIF)

	VIF
ChatGPT Usage -> Tension-pressure	1.000
ChatGPT Usage -> Perceived choice	1.000
ChatGPT Usage -> Perceived competence	1.000
ChatGPT Usage -> Perceived value	1.000

Furthermore, the results of the structural model test to test the proposed hypothesis can be seen in Table 5, which shows that the use of Chatgpt has an influence on all predictors of learning motivation, where the variable Pressure Tension has a negative influence and the rest have a positive influence. The magnitude of the influence for each predictor variable has a large influence on the variables of perceived choice and perceived competence ( $f^2 \geq 0.35$ ), and the rest have a moderate influence ( $0.15 \leq f^2 \leq 0.35$ ). The basis for our decision-making in determining the magnitude of the direct effect refers to (17) who recommends as a threshold value of  $f^2$  where values of 0.02, 0.15, and 0.35 indicate small, medium, and large effect sizes, respectively. A value less than 0.02 indicates no measurable effect.

**Table 5.** Summary of Constructs' Associations and Influences

Relationship	Path Coefficients	T Value	P values	Effect Size ( $f^2$ )	Category
GPT -> TP	-0.481	15.259	0.000	0.30	Medium
GPT -> PCH	0.517	16.512	0.000	0.36	Large
GPT -> PCT	0.507	16.382	0.000	0.35	Large
GPT -> PV	0.499	16.632	0.000	0.31	Medium

GPT= chatgpt usage; TT = tension-pressure; PCH = perceived choice; PCT = perceived competence; PV = Perceived value

The Coefficient of Determination is used to assess the ability of exogenous constructs to explain endogenous constructs. The closer to one the Coefficient of Determination value is, the higher the explanatory power of the model (17). Table 6 shows that the four predictors of learning motivation—pressure, tension, perceived choice, perceived competence, and perceived value—can be explained by the use of ChatGPT by 23 percent, 26 percent, 25 percent, and 24 percent, respectively.

**Table 6.** Coefficient of Determination ( $R^2$ )

	R-square
Tension-Pressure	0.231
Perceived Choice	0.267
Perceived Competence	0.257
Perceived Value	0.249

The final step we take is to evaluate the predictive ability of the model using the PLSpredict test. The results of the output from the PLSpredict test in table 7 show that

the  $Q^2_{\text{predict}}$  value on all indicators contained in the endogenous construct is  $> 0$ , which means that the model has predictive power (22). Furthermore, based on the comparison of the value of PLS-SEM\_RMSE/MAE with LM\_RMSE/MAE shows that the minority of the dependent construct's indicators produces lower PLS-SEM prediction errors compared to the naïve LM benchmark, this indicates that the model has a low predictive power.

**Table 6.** PLSpredict Result

	$Q^2_{\text{predict}}$	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE
KD1	0.194	0.656	0.525	0.657	0.519
KD2	0.126	0.724	0.548	0.718	0.543
KD3	0.211	0.672	0.530	0.672	0.523
KD4	0.206	0.650	0.526	0.651	0.521
KD5	0.186	0.653	0.527	0.655	0.527
ND1	0.190	0.674	0.525	0.667	0.517
ND2	0.209	0.674	0.518	0.667	0.508
ND3	0.202	0.677	0.512	0.661	0.498
ND4	0.199	0.673	0.529	0.671	0.523
PD1	0.221	0.650	0.511	0.652	0.511
PD2	0.238	0.630	0.494	0.626	0.485
TT1	0.202	0.695	0.544	0.694	0.534
TT3	0.184	0.678	0.539	0.677	0.536

## DISCUSSION

The purpose of this study is to explore the impact of ChatGPT on students' learning motivation through a social determination theory approach. Through this approach, four predictors are assumed to be the main predictors in determining students' learning motivation: tension pressure, perceived choice, perceived competence, and perceived value. The results of this study indicate that ChatGPT use influences these four predictors both positively and negatively. The first predictor that impacts ChatGPT use is tension pressure, where the use of ChatGPT in assisting students' academic tasks will reduce the tension felt by students, especially in this study. Research shows that ChatGPT often reduces students' academic workload, thereby reducing stress levels. For example, (23) reported that the integration of AI tools, specifically ChatGPT, in academic activities helped ease students' workload. They found that the use of AI reduced stress related to academic workload, thus contributing to higher happiness scores. The findings also revealed a significant decrease in stress levels, as the use of ChatGPT reduced the workload and provided immediate academic support, reducing the pressure of time management and completion. In other words, using ChatGPT as a virtual tutor or learning assistant can make tasks like writing papers or understanding concepts more manageable, making students feel less stressed and less stressed. Furthermore, this tool also helps students create a more inclusive learning environment, reducing the anxiety and isolation often experienced by those with unique learning challenges (1).

The second predictor of ChatGPT use is perceived choice. Perceived choice refers to students' sense of autonomy in managing their own learning process and is an important aspect of intrinsic motivation. (10) in their research highlighted that ChatGPT encourages independence during learning activities. This means that ChatGPT allows students to learn at their own pace and in a way that they choose,

empowering them to control the pace of their learning experience with ChatGPT (10). In other words, when ChatGPT is used, students have more freedom to choose how to learn, such as reviewing difficult topics or moving faster on material they already understand, which strengthens the sense of choice they feel.

The next finding is the positive influence on perceived competence. The aspect of perceived competence is related to students' confidence in their ability to master the material. The use of ChatGPT has been shown to increase students' sense of competence, as ChatGPT can answer students' questions accurately and comprehensively. In a study (10), survey results showed that students felt an increase in competence when using ChatGPT. The study reported that "the findings indicate a substantial experience of competence among students when using ChatGPT in learning activities actually helps students understand the material and solve their learning problems. Thus, when students perceive that ChatGPT is able to help them overcome academic difficulties by providing additional explanations or demonstrating example problems, their feelings of competence increase. Other studies have shown similar results, finding that perceived competence using ChatGPT has a significant positive influence on learning interest, where the more students feel capable of utilizing ChatGPT, the more confident they are in learning and motivated (9).

The final finding of this study is an increase in students' perceived value by using ChatGPT in learning. Perceived value refers to students' subjective assessment of the usefulness or relevance of a tool in a learning context. ChatGPT tends to increase perceived value due to its ability to create a more personalized and effective learning experience. The value of ChatGPT lies in its ability to adapt learning to students' needs, for example by providing relevant examples or supplementary materials, thereby improving their academic performance. This leads students to rate ChatGPT as a very useful tool (5, 23–25). Empirically, (9) also noted that understanding the importance of AI, the perceived value dimension of ChatGPT, positively increases learning motivation. In other words, when students realize how useful ChatGPT is for the learning process, their perceived intrinsic value increases, which further supports their learning motivation. This point underscores that students' perceptions of ChatGPT's value (benefits) play a significant role in their acceptance and motivation; the greater the perceived value, the stronger the tendency for students to utilize ChatGPT in their learning.

As with all studies, this study was not without limitations. First, the scope of this study only covers fourth-semester students from one Faculty at the University of Jambi, so the generalization of the research results to a wider student population or to other educational institutions is limited. Second, the use of a closed-ended questionnaire completed independently by respondents opens the possibility of perceptual bias or social response, where respondents may answer based on what is considered "good" or "desirable," rather than based on actual conditions. Third, there is a lack of qualitative information that could provide additional causal insights into the research findings. Additionally, the resulting research model demonstrated low predictive ability based on the PLSpredict test results, indicating that although the relationships between constructs are significant, the model's ability to predict real-world phenomena is still limited.

## CONCLUSIONS

This study aimed to explore the effect of ChatGPT use on student learning motivation through four key predictors within the Self-Determination Theory framework: stress, perceived choice, perceived competence, and perceived value. The

**Commented [H1]:** mismatch: The sample described here does not align with the target population defined in the introduction. Please reconcile.

results showed that all hypotheses were supported, with ChatGPT use proven to reduce student stress and increase three other aspects that contribute to learning motivation. Students felt more freedom in determining their learning methods and rhythms, were better able to understand material and complete assignments with the help of ChatGPT, and perceived this technology as a useful and relevant tool in the learning process. These findings confirm that ChatGPT integration has significant potential to strengthen learning motivation by fulfilling the psychological needs of autonomy, competence, and perceived academic value.

In terms of practical implications, the results of this study suggest that educators and educational institutions can utilize ChatGPT as a learning tool that can reduce student academic burden, support independent learning, and enhance conceptual understanding. Furthermore, the study recommends that universities develop responsible AI literacy policies so that ChatGPT can be used optimally without compromising academic integrity. Future research is recommended to expand the sample size to include various universities and study programs, employ a longitudinal design to assess long-term motivational changes, add relatedness variables, which are key psychological needs in SDT, and incorporate actual ChatGPT usage data to improve the accuracy of the findings. Thus, future research can provide a more comprehensive picture of how artificial intelligence technology influences student learning dynamics in a more in-depth and sustainable manner.

#### CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.”

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#### DECLARATION OF ARTIFICIAL INTELLIGENCE USE

*“This study used artificial intelligence (AI) tools and methodologies in the following capacities:*

1. **Manuscript writing support:** AI-based language models, such as [for example, ChatGPT, Quillbot], were/was employed to
  1. Language refinement (improving the grammar, sentence structure, and readability of the manuscript).
  2. Content summarization (assisting in summarizing the findings and conclusions concisely).
  3. Technical writing assistance (providing suggestions for structuring complex technical descriptions more effectively)

#### REFERENCES

1. Abbas M, Jam FA, Khan TI. Is it harmful or helpful? Examining the causes and consequences of generative AI usage among university students. *International journal of educational technology in higher education* [Internet]. 2024 Dec 1 [cited 2025 Nov 19];21(1). <https://doi.org/10.1186/s41239-024-00444-7>.
2. Bahroun Z, Anane C, Ahmed V, Zacca A. Transforming education: A comprehensive review of generative artificial intelligence in educational settings through bibliometric and content analysis. *Sustainability*. 2023 [cited 2025 Nov 19];15(17):12983. <https://doi.org/10.3390/su151712983>.

3. Stojanov A. Learning with ChatGPT 3.5 as a more knowledgeable other: An autoethnographic study. *International Journal of Educational Technology in Higher Education*. 2023 Dec 1 [cited 2025 Nov 19];20(1):35. <https://doi.org/10.1186/s41239-023-00404-7>.
4. Wang J, Fan W. The effect of ChatGPT on students' learning performance, learning perception, and higher-order thinking: insights from a meta-analysis. *Humanit Soc Sci Commun*. 2025 [cited 2025 May 13];12(1):1–21. <https://doi.org/10.1057/s41599-025-04787-y>.
5. Chan C, Hu W. Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*. 2023 Dec 1 [cited 2025 Nov 25];20(1):43. <https://doi.org/10.1186/s41239-023-00411-8>.
6. Chaudhry IS, Sarwary SAM, El Refae GA, Chabchoub H. Time to revisit existing student's performance evaluation approach in higher education sector in a new era of ChatGPT—a case study. *Cogent Education*. 2023 [cited 2025 Nov 19];10(1):2210461. <https://doi.org/10.1080/2331186X.2023.2210461>.
7. Dalalah D, Dalalah OM. The false positives and false negatives of generative AI detection tools in education and academic research: The case of ChatGPT. *The International Journal of Management Education*. 2023 [cited 2025 Nov 19];21:100822. <https://doi.org/10.1016/j.ijme.2023.100822>.
8. Dwivedi Y, Kshetri N, Hughes L, Slade EL, Jeyaraj A, Kar AK, et al. "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and. *Int J Inf Manage [Internet]*. 2023 [cited 2025 Nov 19];71:102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>.
9. Zhou L, Management JLES and, 2023 undefined. The impact of ChatGPT on learning motivation: A study based on self-determination theory. *Education Science and Management*. 2023 [cited 2025 May 13];1(1):19–29. <https://doi.org/10.56578/esmo10103>.
10. Annamalai N, Nasor M. Exploring ChatGPT in education: unveiling learners' experiences through the lens of self-determination theory. *Smart Learning Environments [Internet]*. 2025 Dec 1 [cited 2025 Nov 19];12(1):59. <https://doi.org/10.1186/s40561-025-00393-2>.
11. Yin J, Goh TT, Yang B, Xiaobin Y. Conversation technology with micro-learning: The impact of chatbot-based learning on students' learning motivation and performance. *Journal of Educational Computing Research*. 2021 Mar 1 [cited 2025 May 14];59(1):154–77. <https://doi.org/10.1177/0735633120952067>.
12. Li Y, Sadiq G, Qambar G, Zheng P. The impact of students' use of ChatGPT on their research skills: The mediating effects of autonomous motivation, engagement, and self-directed learning. *Educ Inf Technol*. 2025 Mar 1 [cited 2025 Nov 19];30(4):4185–216. <https://doi.org/10.1007/s10639-024-12981-9>.
13. Dempere J, Modugu K, Hesham A, Ramasamy LK. The impact of ChatGPT on higher education. In *Frontiers in Education*. 2023 [cited 2025 Nov 19];8:1206936. <https://doi.org/10.3389/educ.2023.1206936>.
14. Khurma O, Albahti F, Ali N, Bustanji A. AI ChatGPT and student engagement: Unraveling dimensions through PRISMA analysis for enhanced learning experiences. *Contemp Educ Technol*. 2024 [cited 2025 Oct 10];16:ep503. <https://doi.org/10.30935/cedtech/14334>.
15. Zhang P, Tur G. A systematic review of ChatGPT use in K-12 education. *Eur J Educ*. 2024 Jun 1 [cited 2025 Nov 19];59(2):e12599. <https://doi.org/10.1111/ejed.12599>.
16. Lo C, Hew K, Jong MSY. The influence of ChatGPT on student engagement: A systematic review and future research agenda. *Comput Educ*. 2024 [cited 2025 Nov 19];219:105100. <https://doi.org/10.1016/j.compedu.2024.105100>.

17. Hair JFF, Hult GTM, Ringle CM, Sarstedt M. A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) Third Edition. Los Angeles: SAGE Publications, Inc; 2022.
18. Vieriu A, Petrea G. The Impact of Artificial Intelligence (AI) on Students' Academic Development. *Educ Sci (Basel)*. 2025 [cited 2025 May 13];15(3):343. <https://doi.org/10.3390/educsci15030343>.
19. Septiani Y, Aribbe E, Diansyah R. Analisis Kualitas Layanan Sistem Informasi Akademik Universitas Abdurrahman Terhadap Kepuasan Pengguna Menggunakan Metode Sevqual (Studi Kasus: Mahasiswa). *Jurnal Teknologi Dan Open Source [Internet]*. 2020 [cited 2024 Mar 24];3:131–43. <https://doi.org/10.36378/jtos.v3i1.560>.
20. Nemt-allah M, Khalifa W, Badawy M, Elbably Y, Ibrahim A. Validating the ChatGPT Usage Scale: psychometric properties and factor structures among postgraduate students. *BMC psychology*. 2024 Dec 1 [cited 2025 May 14];12(1). <https://doi.org/10.1186/s40359-024-01983-4>.
21. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*. 2000 [cited 2025 May 14];55(1):68–78. <https://doi.org/10.1037/0003-066X.55.1.68>.
22. Shmueli G, Sarstedt M, Hair J, Cheah JH, Ting H, Vaithilingam S, et al. Predictive model assessment in PLS-SEM: guidelines for using PLSpredict. *Eur J Mark*. 2019 [cited 2025 Jun 12];53(11):2322–47. <https://doi.org/10.1108/EJM-02-2019-0189>.
23. Klimova B, Pikhart M. Exploring the effects of artificial intelligence on student and academic well-being in higher education: A mini-review. *frontiersin.org*. 2025 [cited 2025 Nov 24];16. <https://doi.org/10.3389/fpsyg.2025.1498132>.
24. Baidoo-Anu D, Ansah LO. Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Journal of AI*. 2023 Dec 31 [cited 2025 Nov 25];7(1):52–62. <https://doi.org/10.61969/jai.1337500>.
25. Grassini S. Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. *Educ Sci (Basel)*. 2023 Jul 1 [cited 2025 Nov 25];13(7):692. <https://doi.org/10.3390/educsci13070692>.