

THE IMPACT OF CHATGPT ON THE LEARNING EFFECTIVENESS OF STUDENTS AT HANOI UNIVERSITY OF MINING AND GEOLOGY

TÁC ĐỘNG CỦA CHATGPT ĐẾN HIỆU QUẢ HỌC TẬP CỦA SINH VIÊN TRƯỜNG ĐẠI HỌC MỎ - ĐỊA CHẤT

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Abstract - In the context of digital transformation, artificial intelligence (AI) is increasingly being used in higher education, with ChatGPT becoming a popular tool among students. However, the effects of ChatGPT on students' learning effectiveness have not been clearly measured. By employing reliability testing using Cronbach's Alpha, Exploratory Factor Analysis (EFA), and linear regression analysis with SPSS software, this study investigates the impact of ChatGPT on the learning effectiveness of students at Hanoi University of Mining and Geology. The results indicate that ChatGPT has both positive and negative effects on students' learning effectiveness, among which frequency of use is the most influential factor with $\beta = 0.468$. Based on the research findings, the authors propose several recommendations to improve the effective use of ChatGPT in learning, thereby enhancing students' competencies and contributing to the improvement of educational quality in Vietnam.

Key words - Artificial intelligence; ChatGPT; Learning effectiveness; Student; Hanoi University of Mining and Geology

Tóm tắt - Trong bối cảnh chuyển đổi số, trí tuệ nhân tạo (AI) ngày càng được sử dụng nhiều trong giáo dục đại học, với ChatGPT trở thành công cụ phổ biến cho sinh viên. Tuy nhiên, những tác động của ChatGPT đến hiệu quả học tập của sinh viên vẫn chưa được đo lường rõ ràng. Bằng việc sử dụng các kiểm định độ tin cậy Cronbach's Alpha, phân tích nhân tố khám phá (EFA), và hàm hồi quy tuyến tính, thông qua phần mềm SPSS, chúng tôi đã nghiên cứu tác động của ChatGPT đến hiệu quả học tập của sinh viên Trường Đại học Mỏ - Địa chất. Kết quả chỉ ra rằng, ChatGPT có cả ảnh hưởng tích cực và tiêu cực đến hiệu quả học tập của sinh viên, trong đó, tần suất sử dụng là yếu tố có ảnh hưởng mạnh nhất ($\beta = 0.468$). Dựa trên kết quả nghiên cứu, nhóm tác giả đã khuyến nghị một số giải pháp nhằm nâng cao hiệu quả sử dụng ChatGPT trong học tập, góp phần nâng cao năng lực của sinh viên, góp phần nâng cao chất lượng giáo dục tại Việt Nam.

Từ khóa - Trí tuệ nhân tạo; ChatGPT; Hiệu quả học tập; sinh viên; Trường Đại học Mỏ - Địa chất.

1. Introduction

In recent years, the rapid development of artificial intelligence (AI) has profoundly transformed many fields, with education being one of the most significantly affected. One of the prominent AI tools is ChatGPT (Chat Generative Pre-trained Transformer), developed by OpenAI. ChatGPT is built on an advanced language model and trained on a dataset using deep learning techniques. These methods allow it to capture various linguistic patterns and relationships, understand user input in natural language, and generate seemingly reliable responses in human language within seconds [1]. Therefore, ChatGPT has quickly become a popular learning tool among students worldwide.

In Vietnam, digital transformation in education, guided by the Resolution of the 13th National Party Congress, is expected to receive a strong impetus from the integration of technologies such as ChatGPT. This integration is anticipated to improve the quality of teaching and training, while also equipping highly qualified human resources with creative thinking abilities and essential digital skills [2]. While ChatGPT provides students with significant opportunities, it also presents several potential risks. To ensure the accuracy and reliability of information generated by ChatGPT, students need to verify such information from multiple sources before making final decisions.

For the above reasons, this study focuses on identifying the impact of ChatGPT on the learning effectiveness of students at Hanoi University of Mining and Geology. The study aims to develop practical solutions to provide students with the knowledge and skills needed to use ChatGPT effectively, thereby improving their learning effectiveness, supporting their comprehensive development, and enabling them to take advantage of technological benefits.

2. Literature review

ChatGPT is an AI-powered application capable of natural language processing and data analysis.

Study [3] was conducted to determine the impact of ChatGPT on the learning process of students at universities in Peru, based on Twitter data and using variables including frequency of use, purpose of use, and convenience. The findings indicate that students prefer using ChatGPT because of its speed, free access, and convenience in completing assignments. However, the study also warns that ChatGPT may encourage laziness and limit users' creative thinking, as students may become dependent on AI to complete assignments instead of engaging in self-study.

In contrast to the above viewpoint, study [4] indicates that ChatGPT has only a positive impact on the learning effectiveness of students at universities in the United Arab

Emirates (UAE). Specifically, it increases students’ interest in the learning process, helps learners develop better critical thinking, and contributes to higher academic performance. In Vietnam, study [5] used a questionnaire to analyze the current status of ChatGPT use among students at Vietnam National University Ho Chi Minh City. The research results show that, in addition to its positive aspects, ChatGPT still has several limitations, such as the relatively low quality of information it provides and the lack of specific evidence, which reduces the reliability of written work.

3. Research methodology and data

3.1. Research methodology

Based on previous studies [6] and the objectives of this study, the research team selected a quantitative method using a five-point Likert scale, together with reliability testing using Cronbach’s Alpha, Exploratory Factor Analysis (EFA), and multiple linear regression.

Based on theoretical foundations, variables proposed in previous studies, and several opinions collected during the actual survey process, the authors proposed a research model suitable for the research context at Hanoi University of Mining and Geology, with independent and dependent variables presented in Figure 1.

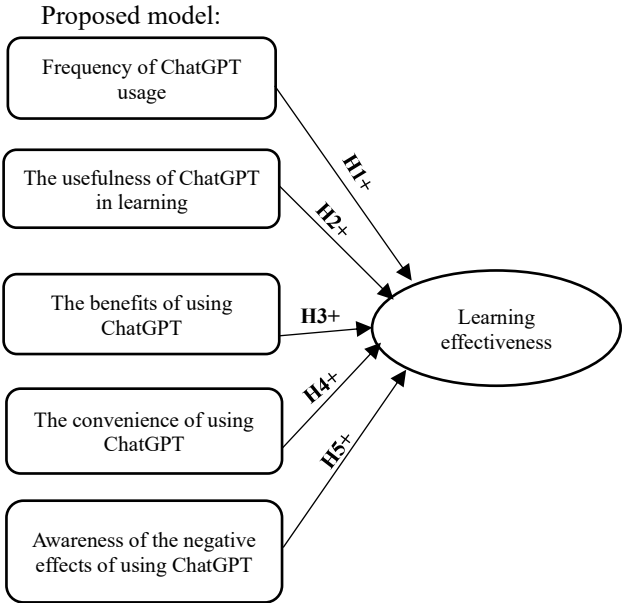


Figure 1. Proposed research model
Source: Proposed by the authors

The research hypotheses are formulated as follows:

H1: Frequency of ChatGPT use has a positive effect on learning effectiveness.

H2: The usefulness of ChatGPT in learning has a positive effect on learning effectiveness.

H3: The benefits of using ChatGPT in learning have a positive effect on learning effectiveness.

H4: The convenience of using ChatGPT in learning has a positive effect on learning effectiveness.

H5: Awareness of the negative effects of using ChatGPT in learning has a positive effect on learning effectiveness.

3.2. Research data

The research subjects are students of Hanoi University of Mining and Geology from all faculties who have used or are currently using ChatGPT as a learning tool.

The survey contents include: frequency of ChatGPT use (TS), usefulness of ChatGPT (CD), benefits of using ChatGPT (LI), convenience of using ChatGPT (TT), awareness of the negative effects of using ChatGPT (TH), and learning effectiveness (HQ). The survey results show that 100% of the participating students had used ChatGPT at least once. This reflects the very high popularity and penetration level of this tool in the current learning environment. ChatGPT is no longer unfamiliar; rather, it has become a familiar part of university students’ learning experience.

4. Research results and discussion

4.1. Descriptive statistics of variables

Table 1. Mean values of variables

No.	Variables	Symbol	Min	Max	Mean	Standard Deviation
1	Frequency of ChatGPT use	TS	1	5	2.9953	0.82618
2	Usefulness of ChatGPT	CD	1	5	3.0556	0.83138
3	Benefits of using ChatGPT	LI	1	5	3.0875	0.81242
4	Convenience of using ChatGPT	TT	1	5	3.1477	0.86051
5	Awareness of the negative effects of using ChatGPT	TH	1	5	3.1943	0.83611
6	Learning effectiveness	HQ	1	5	3.2344	1.30519

Source: Authors’ analysis

Descriptive statistics indicate that students have a positive evaluation of ChatGPT in learning, with the highest mean score belonging to the variable “Learning effectiveness” at 3.23. However, this variable has a large standard deviation, indicating differences in the extent to which students utilize the tool. The variable “Awareness of the negative effects of using ChatGPT” is also rated relatively highly at 3.19, showing that students are clearly aware of potential risks. The variables “Usefulness,” “Benefits,” and “Convenience” have mean scores fluctuating around 3.1, reflecting recognition of the benefits and utility of ChatGPT.

4.1.1. Frequency of use

The descriptive statistical results show that students’ frequency of using ChatGPT in learning is at an average level, with the mean values of the variables ranging from 2.96 to 3.03, corresponding to the response level on the Likert scale. Among them, variable TS3 has the highest mean value, with a mean of 3.03, indicating that students tend to use ChatGPT when encountering questions from lecturers. In contrast, variable TS4 has the lowest mean value, with a mean of 2.96, reflecting that the use of ChatGPT to search for learning materials is not yet truly common. Overall, students have initially used ChatGPT in learning, but the frequency remains moderate.

Table 2. Frequency of ChatGPT use in learning

Variable Symbol	Observed variable statements	Mean	Std. Deviation
TS1	I use ChatGPT for most assignments	3.0	1.006
TS2	I frequently use ChatGPT when encountering new problems	2.99	1.029
TS3	I use ChatGPT immediately when encountering questions from lecturers	3.03	1.003
TS4	I frequently use ChatGPT to search for learning materials	2.96	0.963

Source: Authors' analysis

4.1.2. Usefulness of ChatGPT

Table 3. Usefulness of ChatGPT in learning

Variable Symbol	Observed Variable Statements	Mean	Std. Deviation
CD1	ChatGPT supports me in writing course reports and theses	3.07	1.008
CD2	ChatGPT supports me in searching for learning materials	3.09	1.005
CD3	ChatGPT supports me in learning foreign languages better	3.09	1.029
CD4	ChatGPT provides useful suggestions/ ideas for me during learning	3.07	0.982
CD5	ChatGPT supports the detailed and rapid explanation of new terms	3.10	1.011

Source: Authors' analysis

The results suggest that students evaluate the usefulness of ChatGPT in learning at an average level, with the mean values of the observed variables ranging from 3.07 to 3.10. Among them, variable CD5 - ChatGPT supports the detailed and rapid explanation of new terms - has the highest mean value, with a mean of 3.10, indicating that students highly appreciate the tool's ability to support knowledge explanation. The remaining variables, such as support for report writing, document searching, foreign language learning, and idea suggestions, have relatively similar mean scores, reflecting that ChatGPT is regarded as a useful learning support tool, although the level of evaluation remains moderate.

4.1.3. Benefits of ChatGPT

The descriptive statistical results show that students evaluate the benefits of ChatGPT in learning at an average level, with the mean values of the observed variables ranging from 3.07 to 3.10, corresponding to the response level on the Likert scale. This indicates that ChatGPT is perceived as a useful support tool; however, its impact is not truly prominent.

Among the observed variables, LI5 - ChatGPT helps me become more confident during the learning process - and LI6 - ChatGPT helps me solve problems quickly - have the highest mean values, with a mean of 3.10. This result reflects that students highly appreciate the role of ChatGPT in supporting autonomy and problem-solving ability in learning. The remaining variables clearly indicate the tool's ability to provide fast and diverse information. The relatively uniform mean scores among the variables show that students have a fairly consistent assessment of the benefits of ChatGPT.

Table 4. Benefits of ChatGPT in learning

Variable Symbol	Observed Variable Statements	Mean	Std. Deviation
LI1	ChatGPT helps me save more time in learning	3.07	1.008
LI2	ChatGPT helps me obtain answers quickly	3.09	1.005
LI3	ChatGPT helps me obtain multidimensional sources of information	3.09	1.029
LI4	ChatGPT makes me more interested in learning	3.07	0.982
LI5	ChatGPT helps me become more confident during the learning process	3.10	1.011
LI6	ChatGPT helps me solve problems quickly	3.10	1.029

Source: Authors' analysis

4.1.4. Convenience of ChatGPT

Table 5. Convenience of ChatGPT in learning

Variable Symbol	Observed variable statements	Mean	Std. Deviation
TT1	I can use ChatGPT anytime and anywhere	3.15	1.065
TT2	ChatGPT has an easy-to-use interface	3.15	1.047
TT3	Using ChatGPT can help me personalize learning easily	3.16	1.034
TT4	ChatGPT provides answers to all learning-related problems	3.13	1.006
TT5	Most people can easily use ChatGPT in learning	3.16	1.039

Source: Authors' analysis

The data demonstrate show that students evaluate the convenience of ChatGPT in learning at an average level, with the mean values of the observed variables ranging from 3.13 to 3.16, corresponding to the response level on the Likert scale. Among them, two variables, TT3 - ChatGPT helps personalize learning easily - and TT5 - most people can easily use ChatGPT - have the highest mean values, with a mean of 3.16, indicating that students highly appreciate the adaptability and popularity of this tool.

The remaining variables, such as TT1 - it can be used anytime and anywhere - and TT2 - it has an easy-to-use interface - both have a mean score of 3.15, reflecting that ChatGPT is convenient and user-friendly. Meanwhile, TT4 - ChatGPT provides answers to all learning-related problems - has the lowest score, with a mean of 3.13, showing that students remain cautious about the tool's comprehensive responsiveness.

4.1.5. Awareness of the negative effects of using ChatGPT

The statistical results show that awareness of the negative effects of ChatGPT ranges from 3.17 to 3.22. Among the variables, TH4 reaches the highest level, with a mean of 3.22, demonstrating that students clearly recognize the limitations of AI in updating genuine knowledge. In contrast, variable TH5 records the lowest level, with a mean of 3.17, indicating that this is the aspect students are least concerned about when using the tool.

This result reflects students' critical thinking and confidence. They have a realistic view of the technical

limitations of AI but still believe in their own ability to control their learning and maintain creativity, rather than fearing that technology will completely replace their creative thinking capacity.

Table 6. Awareness of the negative effects of ChatGPT in learning

Variable Symbol	Observed variable statements	Mean	Std. Deviation
TH1	ChatGPT will cause users to lose their ability to think independently	3.19	1.058
TH2	ChatGPT may provide inaccurate information	3.20	1.019
TH3	If used frequently in learning, users will become dependent on ChatGPT	3.18	1.060
TH4	ChatGPT is not yet able to explain new knowledge	3.22	1.005
TH5	ChatGPT will reduce users' creativity in learning	3.17	0.972
TH6	Frequent use of ChatGPT causes users to lose communication and writing abilities	3.20	1.026

Source: Authors' analysis

4.1.6. Learning effectiveness

The statistical results show that learning effectiveness when students use ChatGPT ranges from 3.19 to 3.26. Among the variables, HQ1 and HQ2 reach the highest level, with a mean of 3.26, demonstrating that students highly appreciate the role of AI in optimizing time and simplifying the learning process. In contrast, variable HQ3 records the lowest level, with a mean of 3.19.

Table 7. Effectiveness of ChatGPT in learning

Variable symbol	Observed variable statements	Mean	Std. Deviation
HQ1	Using ChatGPT helps me complete assignments faster	3.26	1.359
HQ2	Using ChatGPT makes learning easier for me	3.26	1.386
HQ3	Using ChatGPT helps me significantly improve my academic performance	3.19	1.407

Source: Authors' analysis

This result reflects that students consider ChatGPT a useful tool that helps increase productivity and reduce learning pressure, rather than a decisive factor leading to breakthroughs in actual learning outcomes or scores. Notably, the standard deviation values in this table are relatively high, above 1.3, indicating clear differentiation in individual experiences. The actual effectiveness that ChatGPT brings still depends greatly on how each student exploits and uses the tool.

4.2. Assessment of scale reliability using Cronbach's Alpha

The results of Cronbach's Alpha analysis show that the independent variables in the study all achieve high reliability, with Cronbach's Alpha coefficients as follows: the variable "Frequency of ChatGPT use" is 0.844; the variable "Usefulness of ChatGPT" is 0.876; the variable "Benefits of using ChatGPT" is 0.890; the variable "Convenience of using ChatGPT" is 0.880; and the variable "Awareness of the negative effects of ChatGPT" is 0.864. The dependent variable "Learning effectiveness"

has a Cronbach's Alpha coefficient of 0.885.

All these coefficients are greater than 0.6, and each observed variable in the scales has a Corrected Item-Total Correlation coefficient greater than 0.3. This indicates that the scales have good internal consistency and are suitable for further use in EFA and subsequent quantitative analyses in the study.

4.3. Exploratory factor analysis

In the KMO and Bartlett's test for the independent variables, the KMO coefficient is 0.850, greater than 0.5, and the Sig. value of Bartlett's test is 0.000, less than 0.005. This proves that the observed variables are correlated with one another and that factor analysis is appropriate for the dataset.

In the evaluation of Eigenvalues, the Eigenvalues of all five factors are greater than 1, with the lowest Eigenvalue being 2.625, which is greater than 1. The total variance extracted from the five factors is 65.469%, indicating that the extracted factors explain 65.469% of the variation of all observed variables in the scale. The total variance extracted is 65.469%, greater than 50%, demonstrating that the EFA model is appropriate.

The results of the Varimax rotated matrix analysis for the five independent variables show that the factor loadings of the observed variables are all greater than 0.35. At the same time, these observed variables are classified based on their distinct attributes and arranged into five independent factor groups.

4.4. Regression analysis

Table 8. Model summary

Model	R	R ²	R ² Adjusted	Std. Error of the Estimate	Durbin-Watson
1	.773	.598	.591	.63937205	1.967

Source: Authors' analysis

Table 8 shows that the adjusted R² value is 0.591, greater than 0.5, proving that the explanatory power of the independent variables for the dependent variable in the regression model is high. This means that 59.1% of the variation in learning effectiveness can be explained by the independent factors in the model. This indicates that the regression model explains most of the variation in students' learning effectiveness.

However, 41.9% of the variation in learning effectiveness remains unexplained by the model, which may be due to other factors not included in the model. The results show that first-order autocorrelation does not occur. The Durbin-Watson value is 1.967, indicating that the model does not violate the linear relationship assumption.

Table 9. ANOVA analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	190.638	5	38.128	93.268	.000
	Residual	128.362	314	.409		
	Total	319.000	319			

Source: Authors' analysis

Table 9 shows that the Sig. value of the F-test is 0.000, less than 0.05, proving that the regression model of the study is appropriate for the dataset. In other words,

ANOVA and t-tests were used by the authors to examine differences in learning effectiveness among student groups by gender, academic year, and faculty. The results show no statistically significant differences among these groups, with p-values greater than 0.05.

This indicates that, in the context of ChatGPT use, demographic factors no longer play a decisive role in learning effectiveness. This may reflect the “balancing” effect brought about by technology, as ChatGPT serves as a learning support tool that can be accessed easily and fairly among student groups, regardless of gender, academic level, or major.

The regression results in Table 10 show that the Sig. values of the t-test for the independent variables, including TS, CD, LI, TT, and TH, are all 0.000, less than 0.05. This proves that these variables are statistically significant and have an effect on the dependent variable, learning effectiveness.

No independent variable is excluded from the model due to a lack of statistical significance.

Table 10. Regression analysis

Model		Unstandardized Coefficient B	Standardized Coefficient Beta	t	Sig.	Tolerance
						VIF
1	Constant	-9.911E-17		.000	1.000	
	TS	.468	.468	13.076	.000	1.000
	CD	.362	.362	10.100	.000	1.000
	LI	.300	.300	8.387	.000	1.000
	TT	.266	.266	7.418	.000	1.000
	TH	.295	.295	8.246	.000	1.000

Source: Authors’ analysis

The Variance Inflation Factor (VIF) values of the variables TS, CD, LI, TT, and TH all range from 1.000 to 1.100, which are less than 5. This indicates that multicollinearity does not occur among the independent variables.

Based on the standardized regression coefficients Beta, the regression model is expressed as follows:
 $HQ = 0.468TS + 0.362CD + 0.300LI + 0.266TT + 0.295TH + \varepsilon$

The results of multiple linear regression analysis show that the TS factor has the strongest impact on students’ learning effectiveness, with $\beta = 0.468$. This can be explained by the fact that the more frequently students use ChatGPT, the more opportunities they have to improve their learning outcomes. However, this result is not sufficient to confirm whether ChatGPT increases students’ actual learning capacity or merely serves as an immediate support tool.

The factor of awareness of the negative effects of ChatGPT (TH) still has a positive influence on students’ learning effectiveness, with $\beta = 0.295$. When students are aware of the potential limitations of ChatGPT, they tend to use this tool cautiously and in a controlled manner, focusing on exploiting its support functions such as suggesting ideas, searching for information, and explaining knowledge, rather than depending entirely on the tool. Therefore, ChatGPT is used as a learning support tool, contributing to the improvement of students’ learning effectiveness.

The research results show that five factors, including frequency of use, usefulness, benefits, convenience, and awareness of the negative effects of using ChatGPT, all have positive and statistically significant effects. At the same time, these factors explain 59.1% of the variation in the variables affecting the learning effectiveness of students at Hanoi University of Mining and Geology. This is a relatively high figure in behavioral studies, confirming that factors related to ChatGPT use have a clearly significant impact on learning effectiveness and that the research model has practical applicability.

5. Conclusion

The application of AI in education is an inevitable trend of the current era. However, if this application is not thoroughly examined, it may cause considerable consequences for users.that ChatGPT has both positive and negative effects on students’ learning effectiveness. Training institutions should issue regulations on the use of ChatGPT in learning, while also developing training courses on effective AI-use skills in education for both students and lecturers. Lecturers, in turn, should regularly update their knowledge and skills in using AI in teaching so that they can guide students to use AI more proactively, think more independently, and use it more effectively.

In addition to the results achieved, this study still has several limitations. This study is mainly based on self-reported survey data reflecting students’ personal perceptions. This may lead to subjective errors and may not fully and objectively reflect learners’ actual learning effectiveness through independent quantitative measures such as cumulative grade point average (GPA) or competency assessment results provided by the university. Therefore, to enhance objectivity and reliability, future research should combine the verification of behavioral survey data with objective secondary data sources provided by training institutions.

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