Journal of Education, Learning Innovation and Transformation
https://ejournal.natacendekia.org/index.php/JOELIT
E-ISSN 3164-8886
Vol. 1, No. 1, June 2026, pp. 12-20

Generative AI in Statistics Education: Investigating the Role of ChatGPT and English Proficiency in Improving Statistical Literacy

Ferawati[1*], Siti Maisaroh[2]
[1,2]Department of Information and Communication Technology, Institut Teknologi & Bisnis Bina Sarana Global, Tangerang, Indonesia
ferawati@global.ac.id

ARTICLE INFO

Article History:

Received : 23/7/2026
Revised : 03/8/2026
Accepted : 10/8/2026
Online : 09/8/2026

Keywords:
ChatGPT;
Generative AI;
English proficiency;
Statistical literacy;
Multiple linear regression.

ABSTRACT

The integration of generative Artificial Intelligence (AI), particularly ChatGPT, has transformed statistics education by providing students with instant explanations, problem-solving support, and personalized learning experiences. However, previous studies have primarily examined the educational benefits of ChatGPT without adequately considering the role of students' English language proficiency, despite the fact that most AI-generated resources and interactions are conducted in English. This gap raises the question of whether ChatGPT utilization alone is sufficient to improve students' statistical literacy or whether English language proficiency also plays a significant role. Therefore, this study aims to examine the influence of ChatGPT Utilization and English Language Proficiency on the Statistical Literacy of Information Systems students. Using a quantitative associative approach with a saturated sampling technique, data were collected from 45 students enrolled in the Statistics course at Institut Teknologi & Bisnis Bina Sarana Global during the 2025/2026 academic year through a Likert-scale questionnaire and analyzed using multiple linear regression after the classical assumption tests were satisfied. The results yielded the regression equation $Y = 11.026 + 0.280X_1 + 0.465X_2$. Simultaneously, ChatGPT Utilization and English Language Proficiency significantly affected Statistical Literacy ($F = 22.359$; $p < 0.001$), with a coefficient of determination (R^2) of 0.516, indicating that 51.6% of the variance in statistical literacy was explained by the two predictors. Partially, ChatGPT Utilization had a positive and significant effect ($t = 2.211$; $p = 0.032$), as did English Language Proficiency ($t = 4.016$; $p < 0.001$), with the latter showing a relatively stronger contribution ($\beta = 0.519$ compared to $\beta = 0.286$). These findings indicate that the effectiveness of ChatGPT in supporting statistics learning depends not only on its utilization but also on students' English language proficiency. Accordingly, integrating generative AI with strategies to strengthen English proficiency may provide a more effective approach to improving statistical literacy in higher education.

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A. INTRODUCTION

The rapid development of generative Artificial Intelligence (AI), particularly ChatGPT, has transformed higher education by providing students with instant explanations, personalized feedback, and interactive learning support. Previous studies have consistently reported that ChatGPT enhances student engagement, promotes self-directed learning, and improves conceptual understanding across various disciplines (Kasneci et al., 2023; Tlili et al., 2023). However, these studies differ in explaining the conditions under which such benefits are achieved. While Kasneci et al. (2023) and Tlili et al. (2023) emphasized the educational opportunities offered by generative AI, Zhai (2023) argued that its effectiveness depends on students' ability to critically evaluate AI-

generated responses and interact effectively with the system. These findings indicate that the educational impact of ChatGPT is influenced not only by the technology itself but also by learner-related factors.

Statistics is a course that requires quantitative reasoning, data interpretation, and mastery of mathematical concepts, which are often perceived as difficult by students in non-pure science programs such as Information Systems. Low statistical literacy may affect students' ability to understand data analysis results, make evidence-based decisions, and critically interpret quantitative information. According to Gal (2022), statistical literacy involves not only computational skills but also the ability to understand, evaluate, and communicate statistical information in real-life situations.

On the other hand, ChatGPT offers considerable potential as a learning support tool that can explain statistical concepts interactively, assist in interpreting analytical outputs, and provide adaptive problem simulations. Several studies have reported that the use of ChatGPT in education can improve conceptual understanding and learning efficiency, particularly in courses that require step-by-step explanations and rapid feedback (Lo, 2023; Zhai, 2023). However, the effectiveness of ChatGPT largely depends on the quality of interaction between users and the AI system.

Most learning resources generated by ChatGPT, as well as advanced statistics literature, are presented in English. This condition suggests that the effectiveness of ChatGPT in improving students' statistical literacy may be closely related to their English Language Proficiency. Students with stronger English proficiency are expected to formulate more accurate prompts, better understand ChatGPT's explanations, and access international academic references more effectively. Previous research has demonstrated a positive relationship between English proficiency, access to digital learning resources, and academic performance in increasingly digitalized higher education environments (Macaro et al., 2020).

The research gap of this study lies in the limited number of studies that simultaneously integrate ChatGPT utilization, English language proficiency, and statistical literacy within a single empirical model. Most previous studies have focused on the general impact of ChatGPT on learning processes or students' perceptions of AI, without quantitatively examining its contribution to statistical literacy as a specific competency outcome (Kasneci et al., 2023; Lo, 2023). Furthermore, research on statistical literacy has generally emphasized pedagogical factors and numerical abilities, while the role of English Language Proficiency as a factor influencing the effectiveness of generative AI in statistics learning has received relatively little attention (Gal, 2022).

Another gap concerns the research setting. To date, only a limited number of studies have been conducted among Information Systems students in Indonesian universities, particularly in technology-oriented private institutions. Information Systems students differ from statistics or pure mathematics students because they tend to have high exposure to digital technologies, yet they may not possess equally strong statistical literacy and English proficiency. This situation indicates the need for empirical research that explains the relationships among these variables in Indonesian higher education.

The novelty of this study lies in three main aspects. First, this study develops a model that simultaneously examines the effects of ChatGPT Utilization (X1) and English Language Proficiency (X2) on Statistical Literacy (Y) using a multiple linear regression approach. Second, English proficiency is treated not merely as a demographic variable but as an academic factor that may influence the effectiveness of students' interactions with generative AI. Third, this study provides empirical evidence from Information Systems

students in Indonesia, a population that remains underrepresented in the international literature on generative AI and statistics education.

Despite these findings, existing studies have generally examined ChatGPT utilization and English language proficiency separately. Research on ChatGPT has primarily focused on students' perceptions, learning engagement, or general academic performance (Kasneci et al., 2023; Lo, 2023), whereas studies on statistical literacy have largely emphasized instructional methods and numerical competence (Gal, 2022). Consequently, empirical evidence explaining how ChatGPT Utilization and English Language Proficiency jointly influence Statistical Literacy remains limited. This limitation is even more evident in Indonesian higher education, particularly among Information Systems students, who frequently use digital technologies but may demonstrate varying levels of statistical literacy and English proficiency.

Based on preliminary observations of students in the Information Systems Study Program at Institut Teknologi & Bisnis Bina Sarana Global, the use of ChatGPT for completing statistics assignments has become increasingly widespread. However, its empirical contribution to improving statistical literacy, as well as the role of English proficiency in influencing this relationship, has not yet been clearly identified. Therefore, this study aims to quantitatively analyze the effects of ChatGPT Utilization (X1) and English Language Proficiency (X2) on Statistical Literacy (Y) using a multiple linear regression approach.

B. METHODS

1. Research Design

This study employed a quantitative approach with a causal-associative research design to examine the causal relationships between two independent variables, namely ChatGPT Utilization (X1) and English Language Proficiency (X2), and one dependent variable, Statistical Literacy (Y). The study used a cross-sectional design in which data were collected at a single point in time during the ongoing semester of the 2025/2026 academic year. This design was considered appropriate because it enables the researcher to measure the relationships among variables simultaneously and to identify the extent to which the independent variables influence the dependent variable.

2. Population and Sample

The population of this study consisted of all students enrolled in the Information Systems Study Program at Institut Teknologi & Bisnis Bina Sarana Global who were taking the Statistics course during the 2025/2026 academic year. Because the population size was relatively small, the study applied a total sampling or census sampling technique, in which all members of the population were included as research participants. Consequently, the final sample comprised 45 students. The use of total sampling was intended to ensure that the data represented the entire population and to minimize sampling error.

3. Research Variables and Instruments

This study involved three variables: ChatGPT Utilization (X1) and English Language Proficiency (X2) as independent variables, and Statistical Literacy (Y) as the dependent variable. The questionnaire items were adapted from previously validated instruments and adjusted to suit the context of statistics learning among Information Systems students. Data were collected using a closed-ended questionnaire measured on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The ChatGPT

Utilization variable was measured through indicators such as frequency of use, trust in ChatGPT responses, ability to formulate effective prompts, and effectiveness of ChatGPT in understanding statistical concepts. English Language Proficiency was assessed through reading ability, understanding of technical vocabulary, ability to write instructions in English, and confidence in communicating in English. Statistical Literacy was measured through students' ability to interpret data, understand probability and inference concepts, read analytical outputs, and communicate statistical conclusions. Before the questionnaire was distributed, the instrument underwent validity and reliability testing. Construct validity was evaluated using the Pearson Product-Moment correlation technique, and all questionnaire items were found to be valid because the calculated correlation coefficients exceeded the critical r-table value at the 5% significance level. Reliability testing was conducted using Cronbach's Alpha, which produced coefficients of 0.812 for ChatGPT Utilization, 0.797 for English Language Proficiency, and 0.834 for Statistical Literacy. Since all coefficients were above the acceptable threshold of 0.70, the instrument was considered reliable and suitable for data collection.

4. Data Analysis Technique

The collected data were analyzed using multiple linear regression analysis with the assistance of statistical software. Prior to conducting the regression analysis, several classical assumption tests were performed to ensure that the data met the assumptions required for regression analysis. These tests included the Shapiro–Wilk test for normality, the Tolerance and Variance Inflation Factor (VIF) tests for multicollinearity, the Breusch–Pagan test for heteroscedasticity, and the Durbin–Watson test for autocorrelation. After the assumptions were satisfied, hypothesis testing was conducted through the F-test to examine the simultaneous effect of the independent variables, the t-test to examine the partial effect of each independent variable, and the coefficient of determination (R^2) to determine the proportion of variance in Statistical Literacy explained by ChatGPT Utilization and English Language Proficiency. All statistical tests were conducted at a 5% significance level ($\alpha = 0.05$). The results of the F-test, t-test, and R^2 were interpreted to determine whether the research hypotheses were supported and to answer the research objectives. The regression model applied in this study was formulated as $Y = a + b1X1 + b2X2 + e$, where Y represents Statistical Literacy, a is the constant, b1 and b2 are the regression coefficients of X1 and X2, X1 represents ChatGPT Utilization, X2 represents English Language Proficiency, and e represents the error term.

C. RESULT AND DISCUSSION

1. Descriptive Statistics

Descriptive statistical analysis was conducted to provide a general overview of the research variable scores obtained from 45 respondents, as presented in Table 1.

Table 1. Descriptive Statistics of the Research Variables

Variable	N	Min	Max	Mean	SD
ChatGPT Utilization (X1)	45	27	60	44.84	6.84
English Language Proficiency (X2)	45	18	60	41.49	7.49
Statistical Literacy (Y)	45	25	54	42.89	6.71

Table 1 shows that the mean score of ChatGPT Utilization (44.84) is relatively higher than that of English Language Proficiency (41.49), while the mean score of Statistical Literacy stands at 42.89. The relatively small standard deviation values indicate a fairly

homogeneous spread of data across respondents. Next, the inter-variable correlation analysis is presented in Table 2 to examine the strength of the relationship between each variable prior to conducting the regression analysis.

Table 2. Inter-Variable Correlation Matrix

Variable	X1	X2	Y
ChatGPT Utilization (X1)	1.000	0.556	0.574
English Language Proficiency (X2)	0.556	1.000	0.678
Statistical Literacy (Y)	0.574	0.678	1.000

The correlation between X1 and Y of 0.574 and between X2 and Y of 0.678 indicates a positive relationship in the moderate-to-strong category. The correlation between X1 and X2 of 0.556 is categorized as moderate and does not exceed the 0.90 threshold, indicating no serious multicollinearity among the independent variables.

2. Classical Assumption Tests

The normality test was conducted on the residual values of the regression model using the Shapiro-Wilk test. The results show a W statistic of 0.980 with a significance value (p-value) of 0.614. Because the significance value is greater than 0.05, it can be concluded that the model residuals are normally distributed, so the normality assumption is satisfied.

Table 3. Multicollinearity Test Results

Variable	Tolerance	VIF
ChatGPT Utilization (X1)	0.691	1.448
English Language Proficiency (X2)	0.691	1.448

The Tolerance values for both independent variables of 0.691 (> 0.10) and the VIF values of 1.448 (< 10) indicate that no multicollinearity occurs between ChatGPT Utilization and English Language Proficiency in the regression model.

3. Multiple Linear Regression Analysis

The results of data processing using multiple linear regression between ChatGPT Utilization (X1) and English Language Proficiency (X2) on Statistical Literacy (Y) are presented in Table 4.

Table 4. Descriptive Statistics of the Research Variables

Model	B	Std. Error	Beta	t	Sig.
(Constant)	11.026	5.052	–	2.182	0.035
ChatGPT Utilization (X1)	0.280	0.127	0.286	2.211	0.032
English Language Proficiency (X2)	0.465	0.116	0.519	4.016	0.000

Based on Table 4, the following multiple linear regression equation was obtained:

$$\mathbf{Y = 11.026 + 0.280\ X1 + 0.465\ X2 + e}$$

This equation shows that a constant value of 11.026 means that if ChatGPT Utilization and English Language Proficiency are zero, Statistical Literacy is predicted to be 11.026. The regression coefficient of X1 (0.280) indicates that each one-unit increase in ChatGPT Utilization will increase Statistical Literacy by 0.280 units, assuming X2 is held constant. The regression coefficient of X2 (0.465) indicates that

each one-unit increase in English Language Proficiency will increase Statistical Literacy by 0.465 units, assuming X1 is held constant. Both coefficients are positive, meaning that both independent variables have a direct (positive) relationship with Statistical Literacy.

4. Hypothesis Testing

Partial Significance Test (t-Test)

Based on Table 4, the ChatGPT Utilization (X1) variable obtained a t-value of 2.211 with a significance of 0.032 (< 0.05), so H1 is accepted, meaning that ChatGPT Utilization has a partial positive and significant effect on Statistical Literacy. The English Language Proficiency (X2) variable obtained a t-value of 4.016 with a significance of 0.000 (< 0.05), so H2 is accepted, meaning that English Language Proficiency has a partial positive and significant effect on Statistical Literacy.

Simultaneous Significance Test (F-Test)

Table 5. F-Test Results (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1021.270	2	510.635	22.359	0.000
Residual	959.175	42	22.837	–	–
Total	1980.444	44	–	–	–

The F-test results show an F-value of 22.359 with a significance of 0.000 (< 0.05), so H3 is accepted. This means that ChatGPT Utilization and English Language Proficiency simultaneously (jointly) have a positive and significant effect on students' Statistical Literacy.

Coefficient of Determination (R^2)

Table 6. Model Summary

R	R Square
0.718	0.516

The R Square (R^2) value of 0.516 indicates that 51.6% of the variation in students' Statistical Literacy can be jointly explained by ChatGPT Utilization and English Language Proficiency, while the remaining 48.4% is explained by other factors outside this research model, such as learning motivation, basic mathematical ability, and the quality of lecturers' teaching.

5. Discussion

The results show that ChatGPT Utilization has a positive and significant effect on the Statistical Literacy of students in the Information Systems study program. This finding is consistent with the view that generative AI can function as a learning assistant that helps students understand abstract statistical concepts through interactive explanations tailored to individual needs (Kasneci et al., 2023), and it aligns with reports that generative AI tools such as ChatGPT can promote personalized, interactive learning and provide ongoing formative feedback (Baidoo-Anu & Owusu Ansah, 2023). It is also directly supported by Wahba et al. (2024), whose quasi-experimental study found that undergraduates who learned statistics with ChatGPT showed significantly greater gains in statistical reasoning and more positive attitudes toward statistics than students taught through conventional methods. Students who make intensive use of ChatGPT to discuss course material, interpret analysis output, or rephrase

explanations in their own words tend to show a better understanding of statistics than students who rarely use it, a pattern consistent with evidence that first-year university students' statistical literacy is closely tied to how actively they engage with describing and interpreting data (Setiawan & Sukoco, 2021).

However, the contribution of English Language Proficiency to Statistical Literacy shows a larger standardized coefficient (β = 0.519) than that of ChatGPT Utilization (β = 0.286). This finding indicates that English proficiency plays a relatively more dominant role in determining students' level of statistical literacy. This is understandable given that most statistical documentation, analysis-software output, instructional videos, and even ChatGPT's own responses remain predominantly in English. Students with strong English proficiency tend to find it easier to understand technical terms such as p-value, confidence interval, or regression coefficient without encountering conceptual translation barriers, consistent with Izatullah et al. (2022), who found a significant positive relationship between English language proficiency and the academic achievement of higher-education students more broadly.

Taken together, the two independent variables were able to explain 51.6% of the variation in Statistical Literacy, indicating that this research model has reasonably good explanatory power for a study in the social-educational domain. Following Ozili's (2023) argument regarding the acceptable R^2 in empirical social-science modelling, an R^2 well above the 0.10 threshold, combined with statistically significant predictors, can be considered a meaningful and acceptable level of explanatory power, since the primary goal of social-science models is typically to identify significant directional relationships rather than to achieve near-perfect prediction. The remaining 48.4% of unexplained variation indicates that other factors also contribute, such as learning motivation, basic mathematical ability, learning style, and the quality of classroom learning interactions — factors consistent with the broader observation that students' statistical-literacy outcomes are shaped by how media and data-visualization messages are read and interpreted at the individual level (Delport, 2023), and which warrant further attention in future research.

These findings have practical implications for the management of the Information Systems study program, namely the need for structured integration of AI-based statistics learning accompanied by efforts to strengthen students' English proficiency. This could be achieved, for example, through the provision of a bilingual glossary of statistical terms and structured training in effective prompt engineering, an approach shown to help students interact more purposefully with generative AI tools in higher-education settings (Eager & Brunton, 2023). Such training should be paired with the development of broader AI literacy so that students can critically evaluate AI-assisted writing and analysis rather than accept it uncritically (Cardon et al., 2023). Lecturer guidance in verifying the accuracy of ChatGPT-generated answers is likewise essential, since over-reliance on AI dialogue systems has been shown to weaken students' critical thinking and analytical reasoning abilities when used without adequate oversight (Zhai et al., 2024). Taken together, these measures are intended to ensure that students benefit from AI-assisted learning without becoming entirely dependent on it at the expense of critical thinking.

D. CONCLUSION AND SUGGESTIONS

Based on the analysis and findings, this study concludes that both ChatGPT Utilization and English Language Proficiency have a positive and significant effect on the Statistical Literacy of Information Systems students, with English Language Proficiency showing a

relatively stronger contribution. Simultaneously, the two variables explain 51.6% of the variance in Statistical Literacy. These findings suggest that universities should integrate guided generative AI-based statistics learning with academic English support, while students should use ChatGPT critically as a learning aid rather than a substitute for analytical thinking and continuously improve their English proficiency to maximize the benefits of generative AI. Nevertheless, this study is limited by its relatively small sample size (n = 45), focus on a single study program at one institution, cross-sectional design that restricts strong causal inference, and reliance on self-reported questionnaire data that may be subject to respondent perception bias.

REFERENCES

Adawiyah, R., & Rahardja, U. (2024). Pemanfaatan ChatGPT sebagai media pembelajaran berbasis kecerdasan buatan di perguruan tinggi. Technomedia Journal, 9(1), 45–57. https://doi.org/10.33050/tmj.v9i1.2267

Azizah, L., & Maulana, F. (2023). Hubungan literasi digital dan kemampuan bahasa Inggris terhadap keberhasilan pembelajaran daring. Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan, 8(9), 1321–1330.

Baidoo-Anu, D., & Owusu Ansah, L. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. Journal of AI, 7(1), 52–62. https://doi.org/10.61969/jai.1337500

Cardon, P., Fleischmann, C., Aritz, J., Logemann, M., & Heidewald, J. (2023). The challenges and opportunities of AI-assisted writing: Developing AI literacy for the AI age. Business and Professional Communication Quarterly, 86(3), 257–295. https://doi.org/10.1177/23294906231176517

Delport, D. H. (2023). The development of statistical literacy among students: Analyzing messages in media articles with Gal's worry questions. Teaching Statistics, 45(2), 61–68. https://doi.org/10.1111/test.12308

Eager, B., & Brunton, R. (2023). Prompting higher education towards AI-augmented teaching and learning practice. Journal of University Teaching and Learning Practice, 20(5), Article 5. https://doi.org/10.53761/1.20.5.02

Gal, I. (2022). Understanding statistical literacy: About knowledge of contexts and models. Statistics Education Research Journal, 21(1), 1–16. https://doi.org/10.52041/serj.v21i1.387

Hidayat, T., & Sari, D. P. (2023). Artificial intelligence dalam transformasi pendidikan tinggi di Indonesia. Jurnal Teknologi Pendidikan, 25(2), 210–221. https://doi.org/10.21009/jtp.v25i2.32567

Izatullah, S., Nasir, R., & Gul, F. (2022). A study to examine the relationship between English language proficiency and academic achievement of students in higher education institutions. Global Educational Studies Review, 7(1), 164–171. https://doi.org/10.31703/gesr.2022(VII-I).17

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., Stadler, M., Weller, J., Kuhn, J., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, Article 102274. https://doi.org/10.1016/j.lindif.2023.102274

Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. Education Sciences, 13(4), 410. https://doi.org/10.3390/educsci13040410

Macaro, E., Curle, S., Pun, J., An, J., & Dearden, J. (2020). A systematic review of English medium instruction in higher education. Language Teaching, 53(1), 36–76. https://doi.org/10.1017/S0261444819000350

Ozili, P. K. (2023). The acceptable R-square in empirical modelling for social science research. In C. A. Saliya (Ed.), Social research methodology and publishing results: A guide to non-native English speakers (pp. 134–143). IGI Global. https://doi.org/10.4018/978-1-6684-6859-3.ch009

Prasetyo, A., & Nugroho, Y. (2024). Analisis penggunaan ChatGPT terhadap motivasi dan hasil belajar mahasiswa. Jurnal Edukasi dan Teknologi Pembelajaran, 4(1), 1–12. https://journal.unesa.ac.id/index.php/jetp/article/view/27456

Rahardja, U., Lutfiani, N., & Aini, Q. (2023). Generative artificial intelligence untuk mendukung pembelajaran adaptif di perguruan tinggi. APTISI Transactions on Technopreneurship, 5(2), 95–106. https://doi.org/10.34306/att.v5i2.358

Saputra, H., & Wibowo, A. (2022). Literasi statistik mahasiswa pada pembelajaran berbasis data. Jurnal Cendekia: Jurnal Pendidikan Matematika, 6(3), 2784–2795. https://doi.org/10.31004/cendekia.v6i3.1684

Setiawan, E. P., & Sukoco, H. (2021). Exploring first year university students' statistical literacy: A case on describing and visualizing data. Journal on Mathematics Education, 12(3), 427–448. https://doi.org/10.22342/jme.12.3.13202.427-448

Suryani, N., & Kurniawan, R. (2023). Pengaruh kemampuan bahasa Inggris terhadap akses sumber belajar digital mahasiswa. Jurnal Pendidikan Bahasa dan Sastra, 23(1), 33–44. https://doi.org/10.17509/bs_jpbsp.v23i1.56321

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. Smart Learning Environments, 10(1), 15. https://doi.org/10.1186/s40561-023-00237-x

UNESCO. (2023). Guidance for generative AI in education and research. UNESCO Publishing. https://unesdoc.unesco.org/ark:/48223/pf0000386693

Wahba, F., Ajlouni, A. O., & Abumosa, M. A. (2024). The impact of ChatGPT-based learning statistics on undergraduates' statistical reasoning and attitudes toward statistics. Eurasia Journal of Mathematics, Science and Technology Education, 20(7), Article em2468. https://doi.org/10.29333/ejmste/14726

Wahyuni, S., & Fitriani, E. (2024). ChatGPT dan etika akademik dalam pembelajaran perguruan tinggi. Jurnal Pendidikan Indonesia, 13(1), 120–131. https://doi.org/10.23887/jpi-undiksha.v13i1.68921

Yuliana, D., & Haryanto, S. (2023). Integrasi artificial intelligence dalam pembelajaran statistika di perguruan tinggi. Jurnal Inovasi Pendidikan Matematika, 11(2), 145–156. https://doi.org/10.21831/jipm.v11i2.60421

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education, 16(1), 39.

Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: A systematic review. Smart Learning Environments, 11, Article 28. https://doi.org/10.1186/s40561-024-00316-7

Zhai, X. (2023). ChatGPT for next generation science learning. Journal of Science Education and Technology, 32(5), 596–600. https://doi.org/10.1007/s10956-023-10000-3

Zulfikar, M., & Putri, A. R. (2024). Pengaruh penggunaan teknologi AI terhadap kemampuan berpikir kritis mahasiswa. Jurnal Pendidikan Teknologi dan Kejuruan, 30(1), 55–66. https://doi.org/10.21831/jptk.v30i1.67218