Global Education Journal
Vol. 4, 2 (May-August, 2026), pp. 2009-2014
EISSN: 2986-6529, DOI: https://doi.org/10.59525/gej.1989

The Effect of Artificial Intelligence (AI) Utilization on Student Self-Confidence in Understanding Mathematical Concepts at AMIK Bukittinggi

Nur Ade Yani[1], M. Imamuddin[2], Shalli Maharani[2], Diana Kartika Dewi[2], Kiki Semartri Fatmi[2]

[1] Akademi Manajemen Informatika dan Komputer (AMIK) Bukittinggi, Indonesia
[2] Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Indonesia

ARTICLE INFO

Keywords:

Artificial Intelligence;
Self-Confidence;
Mathematics Learning;

Article history:

Received 2026-05-28
Revised 2026-06-27
Accepted 2026-08-02

ABSTRACT

The development of artificial intelligence (AI) technology has changed the way students learn mathematics; however, its effect on students' self-confidence in understanding mathematical concepts has not been widely examined quantitatively, particularly in vocational higher education. This study aims to analyze the effect of AI utilization on the self-confidence of AMIK Bukittinggi students in understanding mathematical concepts in the Computer Mathematics course. The study used a quantitative ex post facto approach with a survey method involving 76 students (total sampling), analyzed using simple linear regression with the assistance of SPSS. The analysis results show that the instrument is valid (r-calculated > r-table 0.226) and reliable (Cronbach's Alpha 0.936 for the AI variable and 0.950 for the self-confidence variable), the data are normally distributed (Kolmogorov-Smirnov, $p>0.05$), and there is a significant positive effect of AI utilization on students' self-confidence (t-calculated 4.785 > t-table 1.993; $p<0.001$) with a contribution of 23.6% ($R^2=0.236$). These findings support Bandura's self-efficacy theory, which explains that successful experiences gained through AI assistance can strengthen students' self-confidence in understanding mathematical concepts. The results of this study have implications for lecturers and vocational education institutions in designing AI integration strategies that proportionally support the strengthening of students' self-confidence.

Corresponding Author:
Nur Ade Yani
Akademi Manajemen Informatika dan Komputer (AMIK) Bukittinggi, Indonesia; adeyani813135@gmail.com

1. INTRODUCTION

The development of digital technology over the past decade has brought fundamental changes to nearly every sector of life, including education. One of the technological achievements most widely discussed in recent years is artificial intelligence (AI), a computing system designed to mimic some

human cognitive abilities, such as reasoning, understanding language, and solving problems (Russell & Norvig, 2021). In the context of higher education, the presence of generative AI and AI-based learning assistants has changed the way students access information, complete assignments, and understand technical and abstract course material, including courses in the mathematics field.

In vocational higher education institutions in Indonesia, including the Academy of Informatics Management and Computer Science (AMIK), student use of AI has grown very rapidly, particularly to help understand the mathematical concepts underlying computer science courses such as Computer Mathematics. Studies conducted on university students in Indonesia show that most students routinely use AI-based chatbots to seek additional explanations, verify answers, and practice solving problems considered difficult (Supriyadi & Nasution, 2024).

Although the benefits of AI utilization in mathematics learning have been widely discussed, the psychological aspects accompanying the use of this technology, particularly students' self-confidence in understanding mathematical concepts, have not received equal attention. Mathematics is generally still perceived as a difficult and abstract subject that demands high precision, often causing anxiety and reducing students' confidence in solving mathematical problems (Abd Algani, 2024). Lauster explains that self-confidence is an attitude of belief in one's own abilities so that an individual is not overly anxious in acting, is able to take responsibility for their decisions, and is able to remain calm when facing challenges (Hendriana, Rohaeti, & Soemarmo, 2018).

Several previous studies have confirmed the relationship between external factors in the form of technological support and internal factors in the form of students' self-confidence. Isyana, Baidowi, Novitasari, & Sridana, (2024) found that self-confidence contributes significantly to students' mathematics learning outcomes. A study on the use of AI-based technology by Qiu, (2025) on elementary school students in China showed that learning self-efficacy plays an important role as a mediator in the relationship between AI-based technology and deep learning in mathematics subjects. However, research specifically linking AI utilization with the self-confidence of vocational higher education students in Indonesia is still very limited, indicating a research gap that needs to be filled.

Theoretically, the relationship between the use of learning technology and students' self-belief can be explained through the self-efficacy theory proposed by Bandura, (1997). According to this theory, a person's belief in their own abilities is shaped by four main sources: mastery experience, vicarious experience, verbal persuasion, and physiological and affective states. The use of AI as a learning tool has the potential to strengthen students' mastery experiences through instant feedback and personalized explanations, which in turn can increase students' belief in their own ability to understand mathematical concepts (Kochmar et al., 2020).

Based on the description above, this study aims to analyze the effect of Artificial Intelligence (AI) utilization on students' self-confidence in understanding mathematical concepts at AMIK Bukittinggi. The proposed hypothesis is: Ha, there is a significant effect of AI utilization on students' self-confidence in understanding mathematical concepts.

2. METHODS

This study is a quantitative study with an ex post facto approach, namely a study that examines cause-and-effect relationships that are not manipulated by the researcher because the events or conditions under study have already occurred naturally prior to the research being conducted (Edmonds & Kennedy, 2017). The method used was a survey method with two variables, namely the Utilization of Artificial Intelligence (AI) as the independent variable (X) and Students' Self-Confidence in Understanding Mathematical Concepts as the dependent variable (Y).

The study was conducted at AMIK Bukittinggi with a population of all students who had taken the Computer Mathematics course, totaling 76 students. Given that the population size was relatively small and accessible, the entire population was used as the research sample (total sampling), so the sample size for this study was 76 students.

The research instrument was a closed questionnaire using a 1-5 Likert Scale (Strongly Disagree to Strongly Agree), consisting of 20 statement items for variable X with five indicators (frequency of AI use, ease of access, quality of AI assistance, learning efficiency, and AI attitude and literacy) and 20 statement items for variable Y with five indicators referring to Lauster's adapted indicators (belief in one's own ability, independence in decision-making, positive self-concept, courage to express opinions, and calmness/low anxiety) (Hendriana et al., 2018).

The validity test used the Pearson Product Moment correlation technique between each item score and the corrected total score (corrected item-total correlation); an item was declared valid if r-calculated > r-table at a 5% significance level (df = 74; r-table = 0.226). The reliability test used the Cronbach's Alpha formula, with the criterion of reliable if the Alpha value $\geqslant 0.60$ (Ghozali, 2018). Before hypothesis testing, a normality test was conducted using the one-sample Kolmogorov-Smirnov technique. Hypothesis testing was carried out through simple linear regression analysis, t-test, and the coefficient of determination (R^2), all processed with the assistance of the SPSS application.

3. FINDINGS AND DISCUSSION

This section presents the results of the statistical analysis in sequence, starting from data description, analysis prerequisite testing, to hypothesis testing through simple linear regression.

3.1. Data Description and Analysis Prerequisite Test

Descriptive statistical analysis was conducted on the total scores of variable X (AI Utilization) and variable Y (Self-Confidence) from 76 respondents. The results of the descriptive analysis are presented in Table 1.

Table 1. Descriptive Statistical Analysis Results

Statistic	Variable X (AI Utilization)	Variable Y (Self-Confidence)
N	76	76
Mean	69.87	71.32
Median	70	73
Standard Deviation	11.63	12.80
Minimum – Maximum	48 – 99	39 – 97

Source: Research data, processed with SPSS, 2026.

The average score for the AI Utilization variable was 69.87 (SD=11.63) and the average score for the Self-Confidence variable was 71.32 (SD=12.80), both of which fall into the moderate-to-high category out of a maximum theoretical score of 100.

The validity test using the corrected item-total correlation shows that all 20 items of variable X have r-calculated values ranging from 0.454–0.811 and all 20 items of variable Y range from 0.534–0.795, both of which are greater than the r-table value (0.226; n=76), so all items are declared valid. The reliability test produced a Cronbach's Alpha value of 0.936 for variable X and 0.950 for variable Y, which according to the criteria of Ghozali, (2018) is categorized as highly reliable because it is far above the 0.60 threshold. The Kolmogorov-Smirnov normality test shows a D statistic value of 0.052 (variable X) and 0.073 (variable Y), both of which are smaller than the critical D value (≈ 0.156 at n=76, α=0.05), so the data for both variables are declared normally distributed and meet the prerequisites for linear regression analysis.

3.2. Simple Linear Regression Analysis Results

Simple linear regression analysis was conducted to determine the effect of AI Utilization (X) on Students' Self-Confidence (Y). The data processing results produced the regression equation $\hat{Y} = 33.923 + 0.535X$, as presented in Table 2.

Table 2. Simple Linear Regression Coefficients

Model	B	Std. Error	t-calculated	t-table	Sig.
(Constant)	33.923	7.920	4.283	1.993	<0.001
AI Utilization (X)	0.535	0.112	4.785	1.993	<0.001

Source: Research data, processed with SPSS, 2026.

Table 3. ANOVA

Source	Sum of Squares	df	Mean Square	F-calculated	Sig.
Regression	2,904.54	1	2,904.54	22.90	<0,001
Residual	9,385.88	74	126.84		
Total	12,290.42	75			

Source: Research data, processed with SPSS, 2026.

Table 4. Model Summary

R	R Square	Adjusted R Square	Std. Error of Estimate
0.486	0.236	0.226	11.262

Source: Research data, processed with SPSS, 2026.

The correlation coefficient (R) value of 0.486 indicates a moderate-to-strong positive relationship between the two variables. The R Square value of 0.236 indicates that the AI Utilization variable is able to explain 23.6% of the variation in Students' Self-Confidence, while the remaining 76.4% is explained by other factors outside the model, such as peer social support, learning independence, and mastery of basic mathematics (K. E. Lestari & Yudhanegara, 2017)The calculated t-value for variable X of 4.785 is greater than the t-table value of 1.993 (df=74; α=5%) with a significance of <0.001, so H0 is rejected and Ha is accepted: there is a significant effect of AI Utilization on Students' Self-Confidence in Understanding Mathematical Concepts.

Discussion

The analysis results show that the Utilization of Artificial Intelligence (AI) has a positive and significant effect on Students' Self-Confidence in Understanding Mathematical Concepts, with a contribution of 23.6%. These findings are in line with self-efficacy theory (Bandura, 1997), which explains that mastery experience is one of the main sources of forming a person's self-confidence. The use of AI as an additional learning tool gives students the opportunity to repeatedly gain successful experiences in understanding and solving mathematics problems, thereby gradually strengthening their self-confidence.

These findings are also consistent with the results of research by Qiu, (2025) who found that learning self-efficacy plays an important role as a mediator in the relationship between AI-based technology and deep learning in mathematics subjects, as well as the study by Abd Algani, (2024) who concluded that the appropriate application of AI models has the potential to reduce mathematics anxiety while increasing students' self-confidence. The positive regression coefficient (b=0.535) is also consistent with the findings of Hendricks, Olawale, & Saddiq, (2024) who confirmed that self-confidence in mathematics learning is strongly influenced by the availability and quality of learning resources accessible to students.

Nevertheless, the R^2 value of 0.236 also indicates that most of the variation in students' self-confidence is still explained by other factors outside of AI utilization, such as peer social support B. S. Lestari & Purnamasari, (2022) and learning independence Novitasari, Budiana, & Tampubolon, (2019). Thus, AI utilization should be viewed as one of the supporting factors, not the sole determining factor,

of students' self-confidence in understanding mathematical concepts. The integration of AI in Computer Mathematics learning needs to be structured, for example by directing students to use AI as a tool for verifying answers and as a source of additional explanations, rather than as a substitute for independent thinking, so as not to create a dependency that would be counterproductive to students' authentic self-confidence.

4. CONCLUSION

Based on the analysis results, it can be concluded that the research instrument is valid and highly reliable (Cronbach's Alpha 0.936 for the AI variable and 0.950 for the self-confidence variable), the data are normally distributed, and there is a positive and significant effect of the Utilization of Artificial Intelligence (AI) on Students' Self-Confidence in Understanding Mathematical Concepts, with a contribution of 23.6% (R^2=0.236; t-calculated 4.785 > t-table 1.993; p<0.001). These findings reinforce the relevance of Bandura's (1997) self-efficacy theory in explaining the relationship between technology-based learning experiences and students' self-belief in mathematics learning in vocational higher education.

Further research with a broader sample scope, accompanied by additional control variables such as learning independence, social support, and mastery of basic mathematics, is recommended to obtain a more comprehensive picture of the determinants of students' self-confidence in understanding mathematical concepts in the era of artificial intelligence utilization. For lecturers teaching the Computer Mathematics course, it is recommended to design learning activities that guide students to use AI wisely and proportionally as a supporting tool, rather than as a substitute for independent thinking.

REFERENCES

Abd Algani, Y. (2024). Solving mathematics anxiety, lack of confidence and negative attitude with artificial intelligence models: Insights from stakeholders. *Journal for the Mathematics Education and Teaching Practices*, *5*(2), 89–100. https://doi.org/10.5281/zenodo.14599899

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. W. H. Freeman and Company.

Edmonds, W., & Kennedy, T. (2017). Ex post facto and posttest-only designs. In *An Applied Guide to Research Designs: Quantitative, Qualitative, and Mixed Methods* (2nd ed., pp. 120–124). SAGE Publications.

Ghozali, I. (2018). *Aplikasi Analisis Multivariate dengan Program SPSS*. Semarang: Universitas Diponegoro.

Hendriana, H., Rohaeti, E. E., & Soemarmo, U. (2018). *Hard Skills dan Soft Skills Matematik Siswa*. Refika Aditama.

Hendricks, W., Olawale, B. E., & Saddiq, K. (2024). An investigation of high school preservice teachers' self-efficacy in teaching mathematics. *Education Sciences*, *14*(11), 1262. https://doi.org/10.3390/educsci14111262

Isyana, B. V, Baidowi, Novitasari, D., & Sridana, N. (2024). Pengaruh self confidence terhadap hasil belajar matematika siswa kelas VIII SMP. *Mandalika Mathematics and Education Journal*, *6*(1), 370–383. https://doi.org/10.29303/jm.v6i1.7125

Kochmar, E., Vu, D., Belfer, R., Gupta, V., Serban, I., & Pineau, J. (2020). Automated personalized feedback improves learning gains in an intelligent tutoring system. In *Artificial Intelligence in Education* (Vol. 12164, pp. 140–146). Springer. https://doi.org/10.1007/978-3-030-52240-7_26

Lestari, B. S., & Purnamasari, A. (2022). Dukungan sosial teman sebaya dan problem focused coping dengan stres akademik pada mahasiswa. *Jurnal Psikologi Terapan Dan Pendidikan*, *4*(1), 15. https://doi.org/10.26555/jptp.v4i1.23351

Lestari, K. E., & Yudhanegara, M. R. (2017). *Penelitian Pendidikan Matematika*. Refika Aditama.

Novitasari, I., Budiana, S., & Tampubolon, S. (2019). Hubungan kemandirian belajar dengan percaya diri siswa. *Pedagogia: Jurnal Ilmiah Pendidikan*, *11*(1), 53–61.

https://doi.org/10.55215/pedagogia.v11i1.7193

Qiu, Y. (2025). AI-assisting technology and social support in enhancing deep learning and self-efficacy among primary school students in mathematics in China. *International Journal of Learning, Teaching and Educational Research*. Retrieved from http://ijlter.org/index.php/ijlter/article/view/12269

Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.

Supriyadi, S., & Nasution, R. (2024). Teknologi artificial intelligence (AI) dan literasi digital siswa terhadap hasil belajar mata kuliah evaluasi pembelajaran. *Jurnal Teknodik*, *28*(1), 45–60. https://doi.org/10.32550/teknodik.vi.1185