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The Effect of Artificial Intelligence (AI), Mobile Phones, and Teaching Models on Student Academic Achievement at SMAN 5 Palangka Raya

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ABSTRACT

This study aims to analyze the influence of Artificial Intelligence (AI) utilization, mobile phone usage, and teacher learning models on student academic achievement in Economics at SMAN 5 Palangka Raya. Using a quantitative associative approach with a sample of 123 students, data were collected through valid and reliable questionnaires with a Cronbach's Alpha of 0.887. The utilization of Artificial Intelligence (AI) in learning is closely associated with the use of mobile phones as the primary medium for students to access technology. Multiple linear regression analysis results show that the three variables simultaneously have a significant effect on academic achievement, contributing 98.9% (R2 = 0.989). Partially, AI (β = 0.434), mobile phones (β = 0.396), and teacher learning models (β = 0.499) have positive and significant effects with a significance of 0.000. The teacher learning model was found to be the most dominant factor. This suggests that the pedagogical strategies implemented by teachers play a central role in determining students' academic success. In conclusion, the integration of digital technology supported by adaptive pedagogical strategies is highly effective in enhancing students' academic performance in the digital era. While the integration of digital tools significantly boosts academic performance, pedagogical mastery remains the most critical factor in student success. The findings are expected to provide empirical evidence for schools and teachers in designing relevant and effective learning strategies in the digital era.

Key Word *Artificial Intelligence (AI), Smartphone, Learning Model, Academic Achievement, Economic.*

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INTRODUCTION

In recent years, technological advancements have accelerated rapidly across varioussectors, bringing significant changes to human life. One of the most widely adopted technologies today is Artificial Intelligence (AI). This technology is increasingly utilized in multiple fields, particularly in education. Learning is no longer entirely dependent on conventional methods but is increasingly supported by technological integration, such asthe use of AI, mobile phone usage, and the implementation of instructional models by

teachers. These three factors have become integral components of students' learning activities and have the potential to influence their academic achievement (Haleem, Javaid, Qadri, & Suman, 2022).

The utilization of Artificial Intelligence (AI) in learning is closely associated with the use of mobile phones as the primary medium for students to access technology. Through mobile devices, students frequently use AI tools such as ChatGPT and similar AI assistants to support their understanding of learning materials and complete assignments. Additionally, AI-powered platforms such as Google-based search engines and Google Lens are commonly used to obtain information and solve problems, while adaptive digital learning platforms like Duolingo and Quizizz further enhance the learning experience. The integration of AI and mobile phones offers fast, flexible, and personalized learning opportunities. However, uncontrolled usage may lead to technological dependency and reduced concentration. (Putu Artha Soma , Ibnu Ikhsan , Dotrimensi, 2025) and may affect students' critical thinking skills; therefore, the relationship between AI utilization through smartphones and students' academic achievement needs to be examined empirically.

In addition to technological factors, the instructional model implemented by teachers continues to play a crucial role in determining students' academic achievement. Several learning models commonly applied in secondary education include direct instruction, Problem-Based Learning (PBL), Project-Based Learning (PjBL), and cooperative learning. Previous studies have indicated that the integration of Project-Based Learning (PjBL) with direct instruction can enhance students' academic performance. Student-centered learning models such as PBL and PjBL encourage critical thinking, active discussion, and direct engagement in problem-solving activities, which contribute to deeper understanding and improved learning outcomes. In contrast, monotonous teacher-centered approaches tend to make students more passive, less motivated, and ultimately result in lower academic achievement. Therefore, selecting an appropriate instructional model remains a key factor in supporting students' learning success in the digital era.

Based on preliminary observations and brief interviews conducted by the researcher at SMA Negeri 5 Palangka Raya, several findings highlight the urgency of this study. The data indicate that nearly 95% of students bring mobile phones to school and actively use them to access information. In terms of technology utilization, approximately 70% of students reported regularly using AI tools such as ChatGPT to assist with independent assignments. This phenomenon was directly observed during the researcher's teaching practicum through the School Field Introduction Program (PLP II) at SMA Negeri 5

Palangka Raya. As an Economics teacher directly involved in the instructional process, the researcher observed that almost all twelfth-grade students actively used mobile phones and AI tools, including ChatGPT, to complete both individual and group assignments.(Qurrotu & Haryono, 2021) indicating that there is a significant influence of smartphone use on students' learning outcomes in economics.

Although studies on educational technology have been widely conducted, a research gap still underlies the importance of this study. Most previous studies have focused on the effectiveness of a single factor, for example, examining only the use of artificial intelligence (AI), (Cahya Satria, Setiaji, & Fadhiliya, 2025) or the general impact of smartphone use on students' concentration (Putu Artha Soma , Ibnu Ikhsan , Dotrimensi, 2025). There are still limited studies that simultaneously integrate advanced technology variables (AI), access devices (smartphones), and pedagogical factors (teachers' instructional models) within a single research framework at the senior high school level.

The urgency of this study lies in the phenomenon of a 'digital literacy crisis,' where students often use AI through smartphones merely as an instant tool to complete tasks without deep cognitive processing (cognitive offloading). Without being supported by adaptive instructional models, this technological integration may instead risk diminishing students' critical thinking skills (Cahya Satria et al., 2025). Therefore, conducting this study at SMAN 5 Palangkaraya is highly relevant to examine how the interaction of these three variables influences students' academic achievement within a school ecosystem characterized by high technological accessibility.

The novelty of this study lies in its attempt to reconceptualize the role of teachers, not merely as the sole source of knowledge, but as designers of learning models that must synergize with the presence of AI in students' hands. This study does not only examine the positive impacts of technology but also evaluates whether certain instructional models can mitigate the negative effects of students' dependence on smartphones and AI.

Therefore, this study is urgent in analyzing the simultaneous effects of Artificial Intelligence, smartphone usage, and teachers' instructional models on students' academic achievement at SMAN 5 Palangka Raya. This research aims to examine the influence of each variable and its contribution, particularly in Economics education. The findings are expected to provide empirical evidence for schools and teachers in designing relevant and effective learning strategies in the digital era.

The primary theoretical foundation for examining educational phenomena in the digital era is grounded in connectivism theory, which views learning as a process of forming information networks facilitated by technology. In this context, the utilization of Artificial Intelligence (AI) emerges as a crucial variable that functions as a cognitive partner for students. Menurut (Haleem et al., 2022) AI does not merely function as a tool for retrieving answers, but rather as an adaptive learning platform capable of instantly personalizing learning materials. However, recent studies indicate that excessive reliance on AI-based systems may reduce students' independent cognitive engagement and critical reflection, particularly when AI is used as a substitute rather than as a complement to active learning processes (Cahya Satria et al., 2025) Recent scholarship warns of the risk of cognitive offloading, whereby excessive reliance on AI may degrade students' critical thinking abilities if not accompanied by strong self-regulation. Therefore, the effectiveness of AI in influencing academic achievement largely depends on the interaction pattern between the technology and learners' cognitive processes.

The accessibility of AI cannot be technically separated from the use of smartphones as the primary medium within the mobile learning ecosystem. Smartphone usage provides unlimited flexibility of access; however, it simultaneously introduces residual challenges in the form of concentration distractions. As examined by Dotrimensi and Sunarno (2025), smartphone use in schools demonstrates a complex correlation with students' learning focus: on the one hand, it serves as a gateway to information, yet on the other hand, it has the potential to reduce academic performance when used without proper supervision. This underscores that the presence of hardware devices such as smartphones and AI-based software requires regulatory and pedagogical control factors to ensure their positive contribution to students' academic achievement.

This controlling factor lies in the instructional models implemented by teachers in the classroom. Instructional models are not merely technical teaching procedures but conceptual frameworks that determine how technology is integrated into students' cognitive activities. (Hakim & Yulia, 2024) explains that the transformation of instructional models toward more active and student-centered approaches, such as Problem-Based Learning (PBL), is highly relevant in mitigating the negative impacts of technology. With appropriate instructional models, teachers can guide the use of AI and smartphones as research tools for solving complex problems rather than merely instruments for plagiarism. Ultimately, the synergy between students' digital literacy and the appropriateness of teachers' instructional models becomes a

key predictor in determining academic achievement at the secondary school level (Ramadhani, Sulfasyah, & Latief, 2024).

The synthesis of various theories and prior studies leads to the conclusion that students' academic achievement at SMAN 5 Palangka Raya is simultaneously influenced by these three variables. It is hypothesized that the utilization of AI and smartphones will only produce a significant positive impact on academic achievement when mediated by adaptive and innovative instructional models implemented by teachers. Conversely, technological sophistication may become a barrier to learning outcomes if teachers continue to rely on conventional approaches that fail to integrate technological potential into a curriculum that fosters students' creativity. This interdependent relationship forms the basis for the empirical testing conducted in this study.

RESEARCH METHOD

Research Design

This study employs a quantitative approach with a causal associative research design. This design aims to examine the cause-and-effect relationships between independent variables and the dependent variable. The independent variables in this study consist of :

Independent Variables (X):

X_1 : Utilization of Artificial Intelligence (AI)

X_2 : Smartphone Usage

X_3 : Teachers' Instructional Models (students' perceptions)

Dependent Variable (Y)

Students' Academic Achievement in Economics (measured by report card grades and final examination scores)

The population of this study comprised all active students of SMAN 5 Palangka Raya, totaling 1,174 individuals. The sampling technique employed was purposive sampling based on specific criteria. The selected sample consisted of students from grades X, XI, and XII who were actively enrolled in Economics courses and used digital devices in the learning process.

Primary data were collected using a closed-ended questionnaire based on a five-point Likert scale (1–5). The questionnaire was developed based on indicators of AI utilization in Economics learning tasks, smartphone usage, and students' perceptions of teachers' instructional models. Secondary data, in the form of students' academic achievement (Y), were obtained through documentation techniques, specifically by collecting students' original semester examination scores from the Economics subject teacher.

Before data collection, the instrument was subjected to validity and reliability testing using 30 respondents outside the main sample. The validity test revealed that all items had correlation coefficients exceeding the critical r-value (0.361), indicating that the instrument was valid. Reliability analysis showed Cronbach's Alpha values above 0.60 for all variables, suggesting that the instrument was reliable and internally consistent as a measurement tool.

Data analysis was conducted using statistical software (SPSS). The analytical procedures included the following stages:

1. Classical assumption testing included normality, multicollinearity, and heteroscedasticity tests to ensure that the regression model met the required assumptions and was appropriate for further analysis.
2. Multiple linear regression was employed to test the research hypotheses using the following model:

$$Y=a+b_1X_1+b_2 X_2+ b_3X_3+e$$

The symbols in the model represent:

Y : Students' Academic Achievement in Economics
a : Constant
b_1, b_2, b_3 : Regression coefficients of each independent variable,
X_1 : Artificial Intelligence (AI) Utilization
X_2 : Smartphone Usage
X_3 : Teachers' Instructional Models
e : Error term (other variables outside the model)

Hypothesis testing was conducted using the t-test (partial effect) and F-test (simultaneous effect) at a 5% significance level (0.05). In addition, the coefficient of determination (R^2) was calculated to determine the percentage contribution of AI utilization, smartphone usage, and instructional models to variations in students' academic achievement at SMAN 5 Palangka Raya.

RESULT AND DISCUSSION

Result

This section presents the results of data analysis examining the effects of Artificial Intelligence (AI), smartphone usage, and teachers' instructional models on students' academic achievement at SMAN 5 Palangka Raya. Data were collected from 123 respondents consisting of students from grades X, XI, and XII. The analysis was conducted using SPSS version 25. The validity test was performed using Pearson's Product-Moment correlation between individual item scores (P01–P15) and the total score based on data from 30 respondents. The critical r-value at a 5% significance level (df = 28) was 0.361. The SPSS results indicated that all items had correlation coefficients greater

than 0.361 and significance values below 0.05, confirming that all questionnaire items were valid. The item-total correlation values ranged from 0.462 to 0.769. The highest correlation was found in item P05 (r = 0.769; p = 0.000), while the lowest was in item P14 (r = 0.462; p = 0.010), which still exceeded the minimum validity threshold. The reliability test was conducted to determine the internal consistency of the research instrument. Based on the SPSS analysis, the Cronbach's Alpha value was 0.887 across 15 items. This value exceeds the minimum reliability threshold of 0.70, indicating that the instrument has high reliability and strong internal consistency. Based on the classical assumption tests, the data met the requirements for regression analysis. The classical assumption tests included normality, heteroscedasticity, and multicollinearity tests to ensure the adequacy of the regression model.

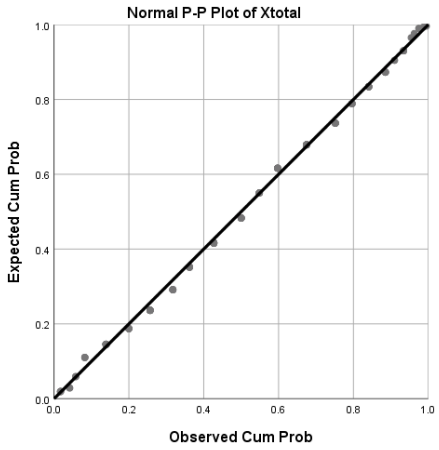

Figure 1.
Normality Test P-P Plot

The normality test using the Normal P–P Plot indicated that the data points were distributed around and followed the diagonal line. Additionally, the detrended plot did not show any specific pattern, indicating that the data were normally distributed.

Tabel 1.
Multicollinearity Test

Coefficients[a]			
		Collinearity Statistics	
Model		Tolerance	VIF
1	x1	.746	1.341
	x2	.654	1.530
	x3	.852	1.174
a. Dependent Variable: y			

The multicollinearity test showed tolerance values of 0.746 (X1), 0.654 (X2), and 0.852 (X3), with corresponding VIF values of 1.341, 1.530, and 1.174. All tolerance values were above the minimum threshold of 0.10 and all VIF values were below 10, indicating that no multicollinearity was present among the independent variables.

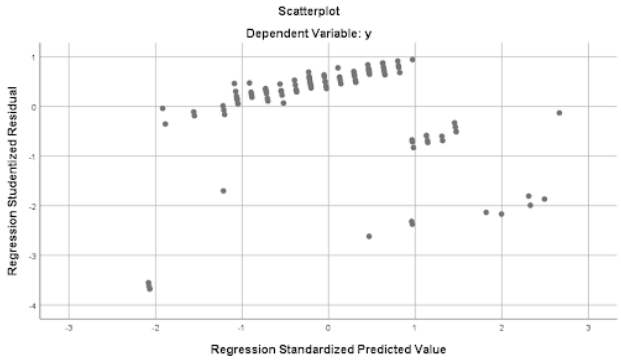

Figure 2.
Heteroscedasticity Test

The heteroscedasticity test using a scatterplot reveals that the data points are randomly dispersed above and below the zero line without forming any specific pattern. This indicates that the regression model does not exhibit symptoms of heteroscedasticity, confirming that the assumption of homoscedasticity is met.

Tabel 2.
Regression Coefficient Analysis
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	23.982	.538		44.587	.000
	x1	.948	.024	.434	38.937	.000
	x2	.953	.029	.396	33.245	.000
	x3	.978	.020	.499	47.836	.000

Based on the regression coefficient analysis, all independent variables exerted a positive and significant influence on student academic achievement. Artificial Intelligence (X1) yielded a regression coefficient of 0.948 with a t-statistic of 38.937 (p = 0.000), indicating that increased AI utilization contributes significantly to academic improvement. Mobile phone usage (X2)

also showed a positive impact with a coefficient of 0.953, a t-statistic of 33.245, and a significance of 0.000, suggesting that productive mobile device use supports learning outcomes. Meanwhile, the Teacher's Learning Model (X3) produced the highest coefficient (0.978) and t-statistic (47.836, p = 0.000), identifying it as the most dominant variable. This is further supported by the highest standardized beta value (β = 0.499) compared to AI ((β = 0.434) and mobile phones ((β = 0.396). Consequently, while technology plays a vital role in modern education, the teacher's instructional model remains the primary factor in enhancing student achievement.

Tabel 3.
Multiple Linear Regression Analysis

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3942.435	3	1314.145	3561.739	.000[b]
	Residual	43.906	119	.369		
	Total	3986.341	122			

The multiple linear regression analysis yielded an F-statistic of 3,561.739 with a significance level of p = 0.000 (p < 0.05$), demonstrating that the regression model is statistically significant. These results indicate that Artificial Intelligence (AI), mobile phone usage, and the teacher's learning model simultaneously exert a significant influence on student academic achievement. The regression Sum of Squares of 3,942.435 out of a total of 3,986.341 shows that the majority of the variation in academic achievement is explained by the three independent variables. Consequently, the regression model is considered highly robust and possesses strong explanatory power regarding the impact of AI, mobile devices, and instructional models on student success.

Tabel 4.
Analisis Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994[a]	.989	.989	.60742

a. Predictors: (Constant), x3, x1, x2

According to the Model Summary results, the correlation coefficient R is 0.994, indicating an exceptionally strong relationship between Artificial Intelligence X1, mobile phone usage X2, the teacher's learning model X3, and student academic achievement. The R-Square value of 0.989 demonstrates that 98.9% of the variance in student achievement can be explained by the three independent variables in the regression model, while the remaining 1.1% is influenced by factors outside the scope of this study. The Adjusted R-Square of 0.989, being nearly identical to the R-Square, indicates high model stability and minimal bias regarding the number of predictors. Furthermore, the Standard Error of the Estimate of 0.60742 suggests a relatively low prediction error. Consequently, the model possesses a very high capacity to explain the impact of AI, mobile devices, and instructional methods on student success.

Discussion

Following the data processing of the questionnaires using SPSS software, the following discussion aims to test and validate the hypotheses formulated previously in this study. Based on the multiple linear regression analysis presented in the ANOVA table, the calculated F-statistic is 3,561.739 with a significance level of $p = 0.000$ ($p < 0.05$). These results lead to the rejection of the null hypothesis H0 and the acceptance of the alternative hypothesis Ha, confirming that Artificial Intelligence (AI), mobile phone usage, and the teacher's learning model simultaneously exert a significant influence on student academic achievement at SMAN 5 Palangka Raya. Furthermore, the R-Square value of 0.989 indicates that these independent variables account for 98.9% of the variance in academic performance, with the remaining 1.1% attributed to factors outside this study. These findings align with research by (Arbi & Kunci) which identifies a significant correlation between AI and student motivation, as well as (Stuart Russell & Peter Norvig, 2021) who posit that AI facilitates the learning process despite varying levels of student acceptance. Based on the partial t-test results for the mobile phone usage variable, a calculated t-statistic of 33.245 was obtained with a significance level of $p = 0.000$ ($p < 0.05$). These results lead to the rejection of the null hypothesis H0 and the acceptance of the alternative hypothesis Ha, indicating that mobile phone usage has a positive and significant effect on student academic achievement. When utilized correctly, mobile phones serve as effective learning media for accessing online materials, educational applications, and other digital resources. This suggests that mobile devices have evolved beyond mere communication tools to become essential instruments in supporting student learning processes (Qhisa, Tarigan, Tifani Aulia, Pionita, & Anggraini, 2025).

Based on the partial t-test results for the mobile phone usage variable, the calculated t-value is 33.245 with a significance level of $p = 0.000$ ($p < 0.05$). These results lead to the rejection of the null hypothesis (H0) and the acceptance of the alternative hypothesis Ha, indicating that mobile phone usage has a positive and significant effect on student academic achievement. Proper utilization of mobile phones serves as an effective learning medium, facilitating access to online materials, educational applications, and other digital resources. This suggests that mobile devices have evolved beyond mere communication tools to become essential instruments in supporting student learning processes (Agdesanda Bagaskara, 2021). Based on the partial t-test results for the teacher's learning model variable, a calculated t-statistic of 47.836 was obtained with a significance level of $p = 0.000$ $p < 0.05$. These results lead to the rejection of the null hypothesis H0 and the acceptance of the alternative hypothesis Ha, indicating that the teacher's learning model has a positive and significant effect on student academic achievement. Notably, this variable achieved the highest regression coefficient and standardized beta value ($\beta = 0.499$), leading to the conclusion that the teacher's instructional model is the most dominant factor influencing student performance. This suggests that the pedagogical strategies implemented by teachers play a central role in determining students' academic success.

CONCLUSION

In conclusion, while the integration of digital tools significantly boosts academic performance, pedagogical mastery remains the most critical factor in student success. Findings suggest that Artificial Intelligence and mobile technology act as powerful supplements to the learning process, yet the teacher’s instructional model remains the cornerstone of educational quality. For schools like SMAN 5 Palangka Raya, the synergy between technological innovation and traditional pedagogical expertise is the key to thriving in the modern digital landscape. Based on the research findings, it can be concluded that Artificial Intelligence (AI), mobile phone usage, and the teacher’s learning model exert a positive and significant influence on student academic achievement at SMAN 5 Palangka Raya. Simultaneously, the three variables demonstrate an exceptionally strong impact on academic performance, with the model’s explanatory power accounting for 98.9% of the variance in learning outcomes. Partial analysis reveals that all variables are statistically significant; however, the teacher’s learning model emerged as the most dominant factor, followed by AI and mobile phone usage. This indicates that while the integration of technology in education effectively enhances student

achievement, the teacher's role through the application of effective instructional models remains the primary determinant of academic success.

Based on the research findings, several recommendations are proposed as follows. First, school authorities are encouraged to optimize the utilization of technology, particularly Artificial Intelligence, as an innovative and adaptive instructional medium to support learning. Second, students are expected to use mobile phones more wisely and productively for academic purposes, such as accessing digital learning repositories and educational applications. Third, teachers are advised to continuously develop creative, interactive, and student-centered learning models to enhance student motivation and academic outcomes. Finally, future researchers are suggested to incorporate additional variables outside the scope of this study such as learning motivation, family environment, or social factors to provide a more comprehensive overview of the various factors influencing student achievement.

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