

## The Role of Artificial Intelligence Literacy and Learning Motivation in Enhancing Students' Critical Thinking Skills

Elfrida Haryati Par<sup>1</sup>, Agustina Butar-Butar<sup>2</sup>, Emirensiana Adha<sup>3</sup>

Universitas Nusa Cendana Kupang, Indonesia

[elfridapar2005@gmail.com](mailto:elfridapar2005@gmail.com), [agustina.butar-butar@staf.undana.ac.id](mailto:agustina.butar-butar@staf.undana.ac.id)

[emirensiana\\_adha@staf.undana.ac.id](mailto:emirensiana_adha@staf.undana.ac.id)

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### ABSTRACT

Critical thinking is an essential skill that students must possess in order to keep pace with technological developments in the digital age. However, many students still have only limited critical thinking skills. This situation is influenced by various factors, such as knowledge of artificial intelligence and motivation to learn, which have not yet been sufficiently fostered in the learning process. The objective of this study is to analyze the influence of AI competencies and learning motivation on the critical thinking skills of business students at Nusa Cendana. The study employs a quantitative method, specifically multiple linear regression. The study sample consisted of 210 respondents, determined using the Solvin formula. Data collection was conducted by distributing a questionnaire whose validity and reliability had been previously tested. The study results show that AI competencies have a positive and significant influence on students' critical thinking skills ( $p < 0.05$ ), as does learning motivation, which also has a positive and significant influence ( $p < 0.05$ ). At the same time, these two variables significantly influence critical thinking skills and explain 73.3% of the variance, while the remaining 26.7%

**Keywords:** Critical Thinking, Artificial Intelligence Literacy, Technology Utilization, Learning Motivation.

### ABSTRAK

Berpikir kritis merupakan keterampilan penting yang harus dimiliki siswa agar dapat mengikuti perkembangan teknologi di era digital. Namun, banyak siswa yang masih memiliki tingkat keterampilan berpikir kritis yang rendah. Hal ini dipengaruhi oleh berbagai faktor, seperti literasi Kecerdasan Buatan dan motivasi belajar, yang belum dimaksimalkan secara optimal dalam proses pembelajaran. Penelitian ini bertujuan untuk menganalisis pengaruh literasi Kecerdasan Buatan dan motivasi belajar terhadap keterampilan berpikir kritis mahasiswa Program Studi Pendidikan Ekonomi Universitas Nusa Cendana. Penelitian ini menggunakan metode kuantitatif, khususnya regresi linier berganda. Sampel penelitian terdiri dari 210 responden yang ditentukan menggunakan rumus Solvin. Pengumpulan data dilakukan melalui penyebaran kuesioner yang telah melalui uji validitas dan reliabilitas. Hasil penelitian menunjukkan bahwa literasi Kecerdasan Buatan memiliki pengaruh positif dan signifikan terhadap kemampuan berpikir kritis mahasiswa ( $p < 0,05$ ), demikian pula dengan motivasi belajar yang juga memiliki pengaruh positif dan signifikan ( $p < 0,05$ ). Secara bersamaan, kedua variabel tersebut secara signifikan memengaruhi kemampuan berpikir kritis, dengan kontribusi sebesar 73,3%, sedangkan 26,7% sisanya dipengaruhi oleh faktor-faktor lain di luar cakupan penelitian ini. Temuan ini

*menunjukkan bahwa literasi Kecerdasan Buatan berfungsi sebagai alat kognitif dalam membantu siswa menganalisis informasi, sementara motivasi*

**Kata Kunci:** *Bepikir Kritis, Literasi Artificial Intelligence, Motivasi Belajar, Pembelajaran Mahasiswa.*

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## A. INTRODUCTION

The use of information and communication technology (ICT) in the 21st century has transformed every aspect of life, including education and learning; as a result, learners are now required to possess critical thinking skills, which are essential competencies. This aligns with the views of Wahyuni et al. (2025), who point out that critical thinking plays a decisive role in the 21st-century learning process. According to Wasuha (2021), critical thinking is an individual's ability to develop previously learned ideas, concepts, and theories in a more concrete direction to solve problems they face. Critical thinking skills are essential for students to solve problems and are particularly important in the learning process. For example, they are necessary for recognizing and mastering concepts, as well as for applying these concepts to real-world situations (Ariadila et al., 2023).

Students' critical thinking skills remain a cause for concern in the field of education, particularly in the Business Education program at Nusa Cendana University. The results of a preliminary study conducted through classroom observation suggest that most students tend to accept the content presented by instructors without analyzing it in depth. Furthermore, the number of students who actively express their opinions and present arguments supported by logical conclusions remains relatively low. This phenomenon is confirmed by the results of interviews with several business education students, who reported that during the learning process in class, they had difficulty analyzing learning concepts and relating them to real-world phenomena, and more often sought answers from digital sources without thoroughly evaluating the information received. This situation suggests that students' higher-order thinking skills remain limited.

This phenomenon can be explained by the constructivist theory of Jean Piaget and Lev Vygotsky further developed by Suparlan (2019). This theory posits that learning is a generative process that individuals actively shape through experiences, interactions, and the understanding of the information they acquire. In this context, the learner possesses not only the ability to passively absorb information but also critical thinking skills that enable them to analyze information and draw logical conclusions. In accordance with this theory, the present study positions the ability to use artificial intelligence as a learning resource as an aid for students in acquiring and processing information, with intrinsic motivation viewed as a factor that promotes more active participation in the learning process.

The first factor believed to influence students' critical thinking skills is proficiency in artificial intelligence. Artificial intelligence is a field focused on the development of systems that mimic human intelligence. In the learning and teaching process, proficiency in artificial intelligence can be used to enhance learning effectiveness by helping students deepen

their learning experiences in a way tailored to their individual needs . (Sagetri & Astuti, 2025). Furthermore, the second factor believed to influence students' critical thinking skills is learning motivation. According to Susanti (2020), learning motivation is a factor that influences the effectiveness of learning. Learning motivation stems from both internal and external sources and drives the individual to actively participate in the learning process to achieve desired goals. Students with high learning motivation tend to explore the subject matter very actively and in depth and to participate intensively in the learning process (Dayanti et al., 2024).

The urgency of this study stems from the fact that critical thinking is of paramount importance in the educational process. This is because critical thinking enables students to adapt to the advancements in information and communication technology in the digital age. Furthermore, these students are preparing to become future teachers and will be expected to impart these thinking skills to their own students. Although numerous studies on critical thinking have already been conducted, the results have been inconsistent. According to Benítez et al. (2025), their findings suggest that the use of artificial intelligence (AI) merely increases work efficiency and does not lead to a significant improvement in critical thinking skills. On the other hand, Vernanda et al. (2025), demonstrate that proficiency with AI influences critical thinking skills because AI functions as an extremely useful tool for expanding knowledge. However, AI must be used correctly to ensure that students' levels of independent thinking do not decline.

The urgency of this study stems from the fact that critical thinking is of crucial importance in the educational process, enabling students to adapt to developments in information and communication technology in the digital age. Students are also being prepared to become future teachers, who will later be expected to instill thinking skills in their students. Numerous studies on critical thinking have already been conducted, yet the results remain inconsistent. According to Benítez et al. (2025), , their research indicates that the use of Artificial Intelligence (AI) merely increases work efficiency but does not result in a significant improvement in critical thinking skills. Vernanda et al. (2025), , on the other hand, demonstrate in their research findings that AI proficiency influences critical thinking skills, as AI serves as an extremely useful tool for expanding knowledge; however, it must be used correctly so that students' level of independent thinking does not decline. However, Octavia et al. (2023), found no significant association between motivation to learn and critical thinking skills, suggesting that motivation to learn does not significantly determine students' critical thinking skills. In contrast, research by Lusiana et al. (2021)) suggests that motivation for learning and critical thinking skills are positively and directly correlated. Consequently, there are currently few studies that simultaneously examine the influence of AI proficiency and motivation for learning on students' critical thinking skills, meaning that the relationship between these two variables is not yet fully understood.

In light of this gap, this study proposes a new approach that integrates learning motivation with the use of artificial intelligence in education. This approach requires appropriate literacy to support the development of students' critical thinking skills.

Furthermore, this study is grounded in an empirical context involving students in the Economics Education Program at Nusa Cendana University. The objective of this study is to analyze the impact of AI literacy and learning motivation, both individually and in combination, on students' critical thinking skills. In line with these objectives, this study conducts a detailed analysis of the effects of AI literacy and learning motivation on the critical thinking skills of students in the Economics Education Program at Nusa Cendana University.

Critical thinking is a process in which individuals use complex thinking skills to examine, analyze, integrate, and interpret ideas logically (Liyanto et al., 2021). Critical thinking skills are essential to help individuals evaluate information, ask relevant questions, assess the information obtained, and draw conclusions based on strong evidence to solve everyday problems (Sumargono et al., 2022). In this study, to measure the variable "critical thinking ability," several indicators developed by Sadeli (2023) were used, including the ability to explain a problem systematically, identify and gather relevant information, draw conclusions based on available evidence, develop explanations through in-depth analysis, and make logical and reasoned decisions.

AI literacy is a person's ability to understand various fundamental concepts and how this technology works, as well as to use it appropriately and responsibly (Meske et al., 2022). AI literacy refers not only to the ability to use AI-based applications but also to the ability to analyze information generated by AI. In an educational context, AI literacy is an important skill that enables students to use technology as a learning resource and to develop a deeper understanding of the subject matter (Hutson et al., 2022). AI literacy encompasses several indicators, including knowledge of AI usage, facilitating the search for educational content, quickly obtaining information, using technology, and problem-solving (Putri, 2025).

Learning motivation is an intrinsic or extrinsic drive to engage in active learning activities in order to achieve learning goals. Motivation also plays a role in determining learners' orientation, engagement, and persistence in the learning process (Novitasari, 2023). Learners with high learning motivation tend to seek information more actively, understand the material, and engage in various learning activities that require thorough analysis and deep understanding. With strong learning motivation, students are more motivated to develop critical thinking skills to understand problems they encounter during the learning process (Liyanto et al., 2021). Indicators of learning motivation include a strong desire and drive for success, the motivation and need to learn, expectations regarding learning, as well as future aspirations and orientation (Sagara et al., 2023).

In this context, the findings of Nadiyah et al. (2025) demonstrate that the appropriate and prudent use of AI as an analytical and reflective tool can foster the development of critical thinking in students. Artificial intelligence has a significant impact on the development of students' critical thinking skills, particularly in the areas of analysis, evaluation, and explanation (Fiani et al., 2025). Furthermore, motivation to learn has a

significant impact on critical thinking skills (Jelita et al., 2024). Additionally, the research findings of Triandika et al. (2023) also show that motivation to learn influences critical thinking skills. However, this study has not yet examined the simultaneous influence of AI literacy and motivation to learn on students' critical thinking skills; therefore, this constitutes the basis and, at the same time, the opportunity for the present study to investigate the phenomenon in question in greater depth.

Based on the theoretical considerations and research findings mentioned above, the following hypotheses can be formulated: H1: AI literacy influences students' critical thinking skills. H2: Learning motivation influences students' critical thinking skills. H3: AI literacy and learning motivation jointly influence students' critical thinking skills.

## B. RESEARCH METHOD

This study employs a quantitative approach using multiple linear regression analysis to clarify the relationship between independent and dependent variables. According to Siringoringo (2025), multiple linear regression is a regression analysis technique that describes the relationship between a dependent variable and multiple factors known as independent variables. Multiple linear regression analysis is an analytical tool used to identify the influence that one variable exerts on another. The general formula for multiple linear regression is  $Y = a + b_1X_1 + b_2X_2 + e$ . This study utilized primary data, with the research subjects being students in the Business Education Program at Nusa Cendana University, and the population consisted of 438 individuals. From this population, the sample size for this study was determined using Slobin's formula, assuming a 5% margin of error. The calculation formula is as follows:

$$n = \frac{N}{1+N(e)^2} = \frac{438}{1+438(0,05)^2} = \frac{438}{1+1,095} = \frac{438}{2,095} = 209,069$$

Based on these calculations, the sample size was set at 209,069, and subsequently rounded up to 210. The characteristics of the respondents in this survey included gender and grade level. According to the data collection results, the respondents consisted of male and female students in varying proportions. Furthermore, the respondents comprised students from multiple grade levels currently enrolled in the Economics Education Program at Nusa Cendana University. This diversity of characteristics indicates that the sample adequately represents the population.

A questionnaire using a 1-to-5 Likert scale was employed as the research instrument. The variable "competence in the field of artificial intelligence" was measured based on indicators of the ability to understand, utilize, and apply AI technology in the learning process. The variable "learning motivation" was measured based on indicators of the will to succeed, drive to learn, and expectations regarding learning outcomes. Meanwhile, critical thinking skills were measured based on indicators of analysis, evaluation, and conclusion-drawing.

In the initial stages, we verified the validity and reliability of the questionnaires to ensure that the collected data were suitable for use in this study. A questionnaire was

deemed valid if the calculated r-value exceeded the r-value in the table, and it was deemed reliable if Cronbach's alpha exceeded 0.6. Prior to data analysis, it was necessary to conduct preliminary tests, including scatter plot analysis and the Glazer test, as well as tests for normality, multicollinearity, linearity, and heteroscedasticity. Following these preliminary tests, hypothesis testing was performed using multiple linear regression analysis with t-tests (for individual variables) and F-tests (for simultaneous analysis). Subsequently, to measure the contribution of the independent and dependent variables and ensure the accuracy of the research results, an analysis of the coefficient of determination ( $R^2$ ) was performed using Statistical Product and Service Solutions (SPSS) software (Amarulloh & Irvani, 2025).

## C. RESULTS AND DISCUSSION

### Result

#### a. Testing Instrument Requirements

##### 1. Validity Test

A validity test is an instrument test conducted to determine the validity of each item in a questionnaire. The validity test is performed using product-moment correlation, which is calculated using IBM SPSS Statistics. An item is considered valid if the calculated r value is greater than the table r value. Based on a pilot study involving 30 respondents, the table r value was determined to be 0.361. The results of the validity test showed that all 15 items of the "Competence in Artificial Intelligence" variable (X1) were classified as valid. For the "Learning Motivation" variable (X2), 15 of the total 20 statements were classified as valid, while the remaining 5 statements were classified as invalid because the calculated r-value was smaller than the table r-value. All 15 items of the "Critical Thinking Skills" (Y) were classified as valid. Thus, the validated items can be used for data collection in this study, while the items classified as invalid were eliminated and not used in subsequent stages of the research.

##### 2. Reliability Test

To assess the consistency of the research instrument, a reliability test was conducted using IBM SPSS Statistics and the Cronbach's alpha coefficient. A variable is considered reliable if it has a Cronbach's alpha value of  $> 0.60$ . Based on the results of the reliability test, the Cronbach's alpha values were 0.8703 for variable X1, 0.8564 for variable X2, and 0.8674 for variable Y. Since all these values are greater than 0.60, it can be concluded that all variables in this study are reliable and suitable for use.

#### b. Analysis prerequisite testing

##### 1. Normality Test

A normality test was conducted to verify whether the residuals in the regression model follow a normal distribution. The normality test used in this study was the one-sample Kolmogorov-Smirnov test, performed using IBM SPSS Statistics, with

the decision criterion that if the significance value is greater than 0.05, the residuals follow a normal distribution (Siregar, 2023). The following table shows the results of the normality test based on the SPSS output

Table 1.1 Normality Test

information	mark
Number of Samples	210
Mean	0.000
Std.Deviation	5.575
Test Statistic	0.036
Asymp.Sig.(2-tailed)	0.200

The results of the normality test, conducted using the one-sample Kolmogorov-Smirnov test, showed that the asymptotic significance level (Asymp. Sig.) was 0.200, which is greater than 0.05. Consequently, the research data follow a normal distribution and meet the requirements to proceed to the next stage of the analysis.

### 2. Multicollinearity Test

The multicollinearity test is performed to determine whether there is a strong correlation between the independent variables in a regression model. If the tolerance value is greater than 0.10 and the VIF value is less than 10.00, there is no multicollinearity (Siregar, 2023). The following table contains the results of the multicollinearity test.

Table 1.2 Multicollinearity Test

Variables	Tolerance	VIF
Artificial Intelligence Literacy	0.468	<b>2.138</b>
Learning Motivation	0.468	<b>2.138</b>

The multicollinearity test yielded a tolerance value of 0.468 and a VIF value of 2.138, leading to the conclusion that there is no multicollinearity among the independent variables.

### 3. Autocorrelation Test

The assumption of autocorrelation is used to identify the relationship between a given period and the previous period. The autocorrelation test is designed to examine the relationship between the residuals of the observations. Autocorrelation issues tend to occur more frequently in time series data, as current values are generally influenced by data from previous periods. If such a relationship is found, it is referred to as an autocorrelation problem Silalahi et al.(2024). The following table presents the results of the autocorrelation test.

**Table 1.3 Autocorrelation Test**

Model	R	R Square	Adjusted R Square	Std. Error	Durbin Waston
1	0,857	0,734	0,731	5,60190	1,706

The Durbin-Watson test yielded a value of 1.706. Since this value falls within the range of 1.5 to 2.5, we can conclude that there is no autocorrelation in the regression model. Thus, the classical assumption regarding autocorrelation is satisfied.

#### 4. Linearity Test

A linearity test was conducted to determine whether the relationship between the independent variable (X) and the dependent variable (Y) is linear (a straight line) or not (Siregar, 2023). This test is based on the departure-from-linearity approach, according to which if the significance value is  $> 0.05$ , there is no departure, which means the relationship is linear, and vice versa. The following table contains the results of the linearity test.

*Table 1.4 Linearity Test (artificial Intelligence)*

Description	F	Sig.
Linearity	425.569	0.000
Deviation From Linearity	0.742	0.866

Based on the results of the linearity test, the significance value for Deviation from Linearity was 0.866 ( $> 0.05$ ). This indicates that there is no deviation from linearity, meaning that the relationship between Artificial Intelligence literacy and critical thinking skills is linear.

*Table 1.5 Linearity Test (Learning Motivation)*

Description	F	Sig.
Linearity	290.051	0.000
Deviation From Linearity	1.181	0.230

The test results reported in the table above yielded a p-value of 0.230. Since this value is greater than 0.05, we can conclude that there is no deviation from linearity; the relationship between learning motivation and critical thinking skills is therefore linear.

## 5. Heteroscedasticity Test

The heteroscedasticity test is designed to detect the presence or absence of unequal residual variances in a regression model (Siregar, 2023). The test was performed using the scatterplot method and the Glejser test. In the Glejser test, the decision criterion is as follows: if the significance value (Sig.) is  $> 0.05$ , then there is no evidence of heteroscedasticity. Here are the results of the heteroscedasticity test:

*Table 1.6 Heteroskedasticity Test (Glejser Test)*

Variables	Coefficient	t	Sig.
Constant	3.061	2.163	0.032
Artificial Intelligence Literacy	0.002	0.055	0.957
Learning Motivation	0.022	0.605	0.546

The results of the Glazer test show that the literacy variable in artificial intelligence has a statistical significance of 0.957 ( $> 0.05$ ), and the learning motivation variable has a value of 0.546 ( $> 0.05$ ). Therefore, it can be concluded that the regression model does not exhibit heteroskedasticity and thus meets the classical assumptions.

### c. Data Analysis Techniques

The data analysis method used in this study is multiple linear regression analysis, which is used to examine the influence of several independent variables on dependent variables (Siregar, 2023). This analysis was used to assess the influence of literacy in AI and motivation for learning on critical thinking skills.

*Table 1.7 Multiple Linear Regression Analysis Results*

Variables	Coefficient (B)	t	Sig.
Constant	-0.167	-0.074	0.941
Artificial Intelligence Literacy	0.653	11.164	0.000
Learning Motivation	0.365	6.301	0.000

Based on the table of results from the multiple linear regression, the regression equation was obtained:  $\gamma = a + b_1X_1 + b_2X_2 + e$ . The coefficient for the independent variable AI literacy is 0.653, the coefficient for motivation to learn is 0.365, and the

constant is  $-0.167$ ; therefore, the equation becomes  $Y = -0.167 + 0.653X_1 + 0.365X_2$ . The regression coefficient of  $0.653$  for AI competence indicates that critical thinking ability improves for every one-unit increase in AI competence. Furthermore, the coefficient of  $0.365$  for learning motivation indicates that an increase in learning motivation also leads to an improvement in critical thinking ability. Although both variables have a positive effect, AI competence has a greater influence.

**d. Hypothesis Testing**

**1. t-test (Partial test)**

The partial t-test was designed to measure the effect of each independent variable on the dependent variable (Siregar, 2023). In this study, a significance level of  $0.05$  was adopted. The results of the partial t-test are presented in the table below:

*Table 1.8 Multiple Linear Regression Results*

Variables	B ( Coefficient)	t	Sig.
Constant	-0.167	-0.074	<b>0.941</b>
Artificial Intelegence Literacy	0.653	11.164	<b>0.000</b>
Learning Motivation	0.365	6.301	<b>0.000</b>

According to the results of the t-test, the p-value for the “AI skills” variable was  $0.000 (< 0.05)$ , while the calculated t-value was  $11.164 (> 1.971)$ ; thus, it can be concluded that AI skills have a positive and significant effect on students’ critical thinking skills. Furthermore, for the variable “motivation to learn,” the significance value was  $0.000 (< 0.05)$  and the calculated t-value was  $6.301 (> 1.971)$ ; thus, it can be concluded that motivation to learn has a positive and significant effect on students’ critical thinking skills.

**2. F Test (Simultaneous Test)**

The F-test was conducted to simultaneously (comprehensively) assess the effects of all independent variables on the dependent variable, serving as the basis for decision-making in this study. If the significance level is less than  $0.05$ , it indicates that the independent variables influence the dependent variable, and vice versa (Siregar, 2023). The results of the simultaneous tests in this study are as follows:

*Table 1.9 ANOVA Test Results (F-Test)*

Source	Sum Of Squares	df	Mean Square	F
Regression	17912.058	2	8956.029	285.394
Residual	6495.923	207	31.381	
Total	24407.981	209		

According to the results of the simultaneous testing (F-test), a p-value of 0.000 ( $< 0.05$ ) and a calculated F-value of 285.394 ( $> 3.04$ ) were obtained. This indicates that knowledge of artificial intelligence and motivation to learn have a simultaneous, positive, and significant impact on students' critical thinking skills.

#### e. Coefficient of Determination Test

To assess the extent to which the explanatory variables influence the dependent variable, we examined the coefficient of determination. The coefficient of determination ranges from 0 to 1 (Siregar, 2023).

*Table 1. 9 Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.857	0.734	0.731	5.602

According to the results of the determination coefficient ( $R^2$ ) test, the adjusted  $R^2$  value was 0.731. This indicates that proficiency in artificial intelligence and learning motivation accounts for 73.3% is explained by artificial intelligence and proficiency in learning motivation, while the remaining 26.7% is influenced by other factors beyond the scope of this study.

## Discussion

### Artificial Intelligence Literacy and Critical Thinking Skills

According to the results of the partial t-test, the significance level for the AI knowledge parameter is  $0.005 < 0.05$ , and the calculated t-value is 11.164, which exceeded the critical t-value of 1.971. This indicates that AI literacy has a significant impact on critical thinking skills. This result is supported by research conducted by Sodikin (2024) Sodikin states that the use of AI accelerates information acquisition and enables students to explore, analyze, compare, and evaluate information, thereby increasing their understanding and encouraging them to think critically. In line with this perspective, Putri (2025) also states that AI literacy can encourage critical thinking by providing students with explainable information. Theoretically, these results can be explained through a constructivist perspective. Constructivism emphasizes that knowledge is actively constructed through interaction with the environment. In this context, AI serves as a cognitive tool that expands learning resources and enriches students' information processing. Therefore, AI literacy not only improves access to information but also plays a role in promoting the development of students' higher-order thinking skills.

### Learning Motivation and Critical Thinking Skills

According to the results of the t-test, the significance level for learning motivation was  $0.001 < 0.05$ , and the calculated t-value was 6.301, which is greater than the critical t-value of 1.971. These results indicate that learning motivation has a positive and significant effect on students' critical thinking skills. This result is supported by a coefficient of

determination of 57.4%, indicating that learning motivation significantly influences students' critical thinking skills. Students with high learning motivation tend to search for information more actively, understand subject content, and conduct in-depth evaluations of the information obtained. This finding is consistent with the research by Octavia et al. (2023), which noted that critical thinking skills can be acquired through strong learning motivation and a desire to learn, thereby driving academic achievement. In other words, individuals with high learning motivation are driven to delve deeper into their studies, thereby enhancing their critical thinking skills. Jelita et al. (2024) also emphasize that strong learning motivation can help individuals remain active and enthusiastic when facing learning challenges, thereby promoting the development of critical thinking skills. These findings can be explained through a constructivist perspective, which emphasizes that learning is an active process influenced by individual-specific internal factors. Learning motivation is the primary driving force that encourages students to actively engage in the learning process, thereby fostering processes such as analysis, evaluation, and reflection—all of which are indispensable components of critical thinking skills. Therefore, learning motivation is not only an incentive for learning but also plays a key role in cultivating students' higher-order thinking skills.

#### **Literacy, Learning Motivation and Critical Thinking Skills**

According to the F-test results, the p-value is  $0.002 < 0.05$ , and the calculated F-value of 289.394 is greater than the critical F-value of 3.04. These results show that both artificial intelligence proficiency and learning motivation have a significant positive effect on students' critical thinking skills. Competence in the field of artificial intelligence helps students to research, understand, analyze, and evaluate the information they receive, while learning motivation encourages students to be more active and persistent during the thought process and not to give up easily.

Theoretically, these findings are consistent with the constructivist perspective, which emphasizes that learning is an active process resulting from the interaction between external and internal factors. In this context, artificial intelligence serves as a cognitive tool that facilitates the knowledge-creation process, while the motivation to learn, as an internal factor, enhances students' active participation in this process.

Based on an analysis of the determinant the adjusted  $R^2$  ( $R^2$ ) was found to be 0.733, which indicates that artificial intelligence and the motivation to learn account for account for 73.3%, while the remaining 26.7% is influenced by factors outside the scope of this study. This suggests that both groups of students are significant factors. Consequently, artificial intelligence and the motivation to learn are key factors

#### **D. CONCLUSION**

The purpose of this study is to investigate how knowledge of artificial intelligence and motivation to learn influence students' critical thinking skills. The results show that knowledge of artificial intelligence and motivation to learn have a partial, positive, and

significant impact on critical thinking skills. Furthermore, these two variables interact and explain 73.3% of the variance, while 26.7% can be attributed to other factors outside the scope of this study. It can be concluded that knowledge in the field of artificial intelligence and learning motivation are factors that can improve students' critical thinking skills. Furthermore, this study contributes to the development of technology-based learning and the improvement of the quality of critical thinking among students, particularly by promoting the use of knowledge in the field of artificial intelligence and by increasing motivation to learn within the learning process.

This study has a number of methodological limitations. Firstly, the empirical observation is limited to the student population of the Economics Education programme at Nusa Cendana University; caution should therefore be exercised before generalising the results to a wider population. Secondly, the analysis focused exclusively on the variables of artificial intelligence culture and academic motivation as predictors of students' critical thinking ability, whilst other potential confounding factors that might play a significant role were not explored in depth.

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