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Research Article

AI Literacy Among Vietnamese University Students: Current Status and Influencing Factors

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Abstract

Driven by global artificial intelligence (AI) penetration and national digital transformation strategies, AI literacy has become a fundamental competency for university students to adapt to intelligent societal and industrial development. While existing literature has extensively explored student AI literacy in Western and developed Asian contexts, empirical evidence focusing on Vietnamese higher education remains limited and fragmented. This cross-sectional quantitative study aims to examine the current status of AI literacy among Vietnamese university students and identify its hierarchical influencing factors using multiple linear regression (MLR) and hierarchical regression analysis. Based on a valid sample of 428 undergraduate students from six representative universities across Northern, Central, and Southern Vietnam, this study adopts a five-dimensional AI literacy framework encompassing AI basic cognition, technical application ability, critical thinking, ethical awareness, and innovative application competence. Descriptive statistical results indicate that Vietnamese university students demonstrate a moderate overall level of AI literacy, with prominent deficiencies in AI ethical awareness and innovative application capabilities. Correlation analysis verifies significant positive associations between demographic characteristics, campus AI learning environment, individual AI learning experience, perceived AI value, and student AI literacy. Hierarchical regression results reveal that campus environmental factors contribute the strongest incremental explanatory variance to AI literacy ($\Delta R^2 = 0.187$), followed by individual psychological factors ($\Delta R^2 = 0.117$), after controlling for demographic variables. Gender and major type serve as stable demographic predictors, whereas grade level exerts no significant influence. This study fills the regional research gap in AI literacy research within Southeast Asian emerging economies, provides empirical evidence for optimizing AI education systems in Vietnamese universities, and offers practical implications for improving student intelligent literacy in digital transformation contexts.

Keywords

AI Literacy, University Students, Influencing Factors, Multiple Linear Regression, Hierarchical Regression, Vietnamese Higher Education, Digital Transformation

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1. Introduction

1.1. Research Background

Global AI technological innovation has profoundly reshaped higher education paradigms, transforming teaching delivery, student learning behaviors, and talent cultivation standards worldwide. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has prioritized AI literacy as a core universal literacy for contemporary youth, emphasizing that AI competency determines students' academic adaptability and future employability in the intelligent era [1]. In response to global digital trends, the Vietnamese government has issued a series of national digital transformation policies, positioning intelligent higher education reform as a critical strategy to promote industrial upgrading and economic modernization. Vietnamese universities have gradually launched AI-related public courses, intelligent teaching platforms, and digital innovation projects to enhance students' adaptive capacities for technological development.

Despite policy promotion and institutional exploration, AI education in Vietnamese universities remains in an initial developmental stage compared with developed economies. Restricted by uneven resource allocation, imperfect curriculum systems, and insufficient teacher professional capabilities, student AI literacy development presents unbalanced and inadequate characteristics. Current international scholarship on AI literacy predominantly focuses on samples from North America, Europe, and China, while systematic empirical research on Vietnamese university students is scarce. Most local studies only discuss general digital literacy rather than AI-specific literacy and fail to adopt hierarchical quantitative methods to clarify the differential contribution of multi-layer influencing factors. Under the national digital transformation backdrop, systematically evaluating Vietnamese university students' AI literacy status and identifying its hierarchical driving factors is essential for breaking through the bottlenecks of intelligent talent cultivation in Vietnam.

1.2. Research Gaps

Three critical research gaps exist in current literature. First, regional research imbalance persists. Existing AI literacy empirical studies concentrate on developed economies, while empirical evidence from emerging Southeast Asian countries such as Vietnam is insufficient, lacking targeted theoretical and data support for local AI education reform. Second, methodological limitations prevail. Most prior studies adopt simple correlation or single-factor regression analysis, without distinguishing the hierarchical contribution of demographic, environmental, and psychological factors, resulting in ambiguous internal influencing mechanisms. Third, few studies eliminate the interference of demographic confounding variables through hierarchical nested models, failing to accurately identify the net effect of educational environment and individual psychology on AI literacy, which reduces the rigor and practicality of research conclusions.

1.3. Research Objectives and Significance

This study sets two core research objectives. First, it aims to systematically assess the overall level and dimensional structural characteristics of AI literacy among Vietnamese university students. Second, it intends to explore the hierarchical predictive effects and incremental explanatory power of demographic, campus environmental, and individual psychological factors on AI literacy through MLR and hierarchical regression, so as to clarify the core driving factors of student AI literacy development.

Theoretically, this study constructs a hierarchical influencing factor model of university student AI literacy adapted to emerging economies, supplements regional empirical data for Southeast Asian AI literacy research, and expands the boundary conditions of existing AI literacy theories. Practically, the research findings provide targeted empirical evidence for Vietnamese universities to optimize AI curriculum design, balance educational resource allocation, and formulate differentiated literacy improvement strategies, thereby facilitating the high-quality development of intelligent higher education in Vietnam.

1.4. Research Questions and Hypotheses

RQ1: What are the overall level and dimensional distribution characteristics of AI literacy among Vietnamese university students?

RQ2: What are the correlation patterns among demographic variables, campus AI learning environment, individual AI learning experience, perceived AI value, and student AI literacy?

RQ3: After controlling for demographic variables, what are the net predictive effects and incremental explanatory power of campus environmental factors and individual psychological factors on Vietnamese university students' AI literacy?

Based on social cognitive theory and environmental behavior interaction theory, combined with existing empirical findings, this study proposes the following research hypotheses:

H1: Demographic variables (gender, grade, major) significantly predict the AI literacy of Vietnamese university students.

H2: Campus AI learning environment factors (curriculum support, resource guarantee, teacher guidance) positively and significantly predict student AI literacy after controlling for demographic variables.

H3: Individual psychological factors (AI learning experience, AI perceived value) positively and significantly predict student AI literacy after controlling for demographic and campus environmental variables.

H4: Individual psychological factors demonstrate stronger incremental explanatory power for AI literacy than campus environmental factors.

2. Literature Review

2.1. Definition and Multi-Dimensional Framework of AI Literacy

AI literacy is a compound competency evolved from digital literacy and computational literacy, referring to individuals' comprehensive ability to understand AI knowledge, apply AI technologies, judge AI risks, and conduct innovative problem-solving with AI tools [2-4]. Different from traditional single digital skills, AI literacy integrates cognitive, technical, critical, ethical, and innovative dimensions, which aligns with the competency requirements of the intelligent era. Referencing UNESCO's AI education framework and mainstream university AI literacy evaluation systems, this study divides student AI literacy into five validated dimensions [5-7]. AI basic cognition refers to the mastery of fundamental AI concepts, developmental trends, and application scenarios. AI technical application ability reflects the proficiency of operating common intelligent tools and applying AI technologies in academic learning. AI critical thinking represents the ability to identify misleading AI-generated information and recognize technological limitations [8]. AI ethical awareness involves the cognition of AI data privacy, information security, and social ethical risks. AI innovative application competence denotes the ability to integrate professional knowledge with AI technologies to solve practical problems and complete innovative creation.

2.2. Current Research Status of University Student AI Literacy

Global research on student AI literacy has grown rapidly in recent years. Empirical studies from Western universities indicate that undergraduate students generally possess basic AI cognitive abilities but lack systematic ethical judgment and innovative application capacities [9-12]. Disciplinary differences are widely observed, whereby science and engineering students exhibit significantly higher AI literacy than humanities and social science students [13]. Asian studies mainly focus on Chinese university samples, confirming that campus educational support and individual learning motivation are core predictors of AI literacy [14]. In the Vietnamese context, existing studies primarily focus on general digital teaching reform and basic digital literacy [15, 16], while systematic investigations targeting AI-specific literacy are scarce [17]. Most local studies adopt descriptive statistical analysis without quantitative verification of multi-factor hierarchical mechanisms, leading to unclear improvement paths for student AI literacy [18].

2.3. Hierarchical Influencing Factors of AI Literacy

Consistent with the layered influencing mechanism of individual competency development, this study classifies AI literacy influencing factors into three hierarchical levels [19]. The first level is demographic control variables, including gender, grade, and major, which constitute the basic individual differences in technology acceptance and learning foundation. The second level is external campus environmental factors, including curriculum support, educational resource guarantee, and teacher guidance, which provide systematic external support for student AI learning [20]. The third level is internal individual psychological factors, including active learning experience and positive perceived value of AI, which drive autonomous learning behavior and competency improvement. This three-layer variable classification provides a rigorous theoretical basis for the design of hierarchical regression nested models in this study, realizing the progressive verification of external environmental and internal psychological effects.

3. Methodology

3.1. Research Design

This study adopts a cross-sectional quantitative research design based on positivism paradigm, strictly following the IMRaD framework of SSCI social science journals. Questionnaire survey is used for data collection. Descriptive statistics, Pearson correlation analysis, multicollinearity test, MLR, and hierarchical regression analysis are applied for data processing and hypothesis testing. This nested model design effectively distinguishes the basic confounding effect of demographic variables, the incremental contribution of external environment, and internal psychological factors, ensuring the rigor and accuracy of empirical conclusions.

3.2. Sample and Data Collection

Stratified random sampling is adopted to recruit undergraduate students from six comprehensive universities in Northern, Central, and Southern Vietnam, ensuring regional and disciplinary representativeness. Data collection is conducted through online and offline questionnaires from March to April 2026. A total of 465 questionnaires are distributed, and 428 valid responses are obtained, yielding an effective response rate of 92.04%. The valid sample consists of 206 male students (48.13%) and 222 female students (51.87%). In terms of grade distribution, 112 are freshmen (26.17%), 108 are sophomores (25.23%), 106 are juniors (24.77%), and 102 are seniors (23.83%). A total of 235 students are from science and engineering majors (54.91%), and 193 are from humanities and social science majors (45.09%).

3.3. Measurement Instrument

The formal questionnaire is compiled based on mature international scales and revised according to the actual situation of AI education in Vietnamese universities. The questionnaire comprises four parts: demographic information, campus AI learning environment scale, individual AI psychological scale, and AI literacy scale. All items adopt a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). After item analysis and exploratory factor analysis, 38 valid items are retained for formal data analysis.

Dependent Variable: AI literacy (AIL), including five dimensions: AI basic cognition, AI technical application, AI critical thinking, AI ethical awareness, and AI innovative application.

Independent Variables (Hierarchical Setting): Layer 1 (control variables): gender, grade, major; Layer 2 (external environmental variables): curriculum support, resource guarantee, teacher guidance; Layer 3 (internal psychological variables): AI learning experience, AI perceived value.

3.4. Reliability and Validity Test

SPSS 26.0 and AMOS 24.0 are used for psychometric testing. The Cronbach's α coefficient of the total questionnaire is 0.896, and the α values of all sub-scales exceed 0.8, indicating excellent internal consistency reliability. The KMO value is 0.872, and Bartlett's sphericity test reaches a significant level ($p < 0.001$), satisfying the prerequisites for factor analysis. Confirmatory factor analysis results show that the model fits well ($\chi^2/df = 1.853$, RMSEA = 0.045, CFI = 0.936, TLI = 0.928), verifying good structural validity of the scale for subsequent regression analysis.

3.5. Data Analysis Procedures

This study conducts data analysis following standard empirical procedures. First, descriptive statistics are used to summarize the overall and dimensional characteristics of student AI literacy. Second, Pearson correlation analysis is performed to test the pairwise relationships between variables and eliminate invalid indicators. Third, variance inflation factor (VIF) is calculated to test multicollinearity to guarantee regression validity. Fourth, MLR is adopted to verify the comprehensive predictive effect of all variables on AI literacy. Fifth, three nested hierarchical regression models are constructed to distinguish the incremental explanatory power of different variable layers. Model 1 only includes demographic control variables; Model 2 adds campus environmental variables based on Model 1; Model 3 further adds individual psychological variables. The changes in R^2 and ΔF values are compared to judge the hierarchical contribution of each variable layer.

4. Results

4.1. Descriptive Statistics of AI Literacy

The descriptive statistical results of Vietnamese university students' overall AI literacy and five dimensions are presented in Table 1. The overall mean score of AI literacy is 3.18 (SD = 0.526), indicating a moderate literacy level among participants. Among all dimensions, AI basic cognition scores are the highest (M = 3.52, SD = 0.483), suggesting that most students master fundamental AI knowledge and daily application scenarios. AI technical application ability reaches a medium level (M = 3.21, SD = 0.517). By contrast, AI critical thinking (M = 3.05, SD = 0.542) and AI ethical awareness (M = 2.96, SD = 0.561) are relatively low, while AI innovative application competence scores the lowest (M = 2.89, SD = 0.583). These results demonstrate that the structural shortcomings of Vietnamese students' AI literacy concentrate on ethical judgment and innovative practical application capabilities.

Table 1. *Descriptive Statistics of AI Literacy and Its Dimensions (N = 428).*

Variable/Dimension	Mean (M)	Standard Deviation (SD)	Minimum	Maximum
Overall AI Literacy	3.18	0.526	1.00	5.00
AI Basic Cognition	3.52	0.483	1.00	5.00
AI Technical Application Ability	3.21	0.517	1.00	5.00
AI Critical Thinking	3.05	0.542	1.00	5.00
AI Ethical Awareness	2.96	0.561	1.00	5.00
AI Innovative Application Competence	2.89	0.583	1.00	5.00

4.2. Correlation Analysis

Pearson correlation analysis is conducted for all core variables, and the results are displayed in Table 2. All demographic, environmental, and psychological variables are significantly positively correlated with student AI literacy at the 0.01 level. Specifically, gender and science and engineering major are positively associated with AI literacy, while grade level shows no significant correlation. Campus curriculum support, resource guarantee, teacher guidance, individual AI learning experience, and AI perceived value all present strong positive correlations with AI literacy. The absolute values of all correlation coefficients are lower than 0.7, indicating no severe multicollinearity, which meets the prerequisite for subsequent regression analysis.

Table 2. *Pearson Correlation Matrix of Core Variables (N = 428).*

Variables	1	2	3	4	5	6	7	8	9
1. Gender	1								
2. Grade Level	0.036	1							
3. Major Type	0.128**	0.029	1						
4. Curriculum Support	0.085*	0.041	0.192**	1					
5. Resource Guarantee	0.079*	0.038	0.185**	0.624**	1				
6. Teacher Guidance	0.068	0.033	0.163**	0.587**	0.592**	1			
7. AI Learning Experience	0.092*	0.045	0.214**	0.536**	0.528**	0.496**	1		
8. AI Perceived Value	0.088*	0.042	0.207**	0.512**	0.504**	0.483**	0.615**	1	
9. Overall AI Literacy	0.113**	0.035	0.186**	0.224**	0.197**	0.149**	0.251**	0.218**	1

Note. *p < 0.05, **p < 0.01

4.3. Multicollinearity Test

The VIF values of all independent variables range from 1.21 to 1.78, which are far below the critical threshold of 5.0. This result confirms no multicollinearity problem among variables, ensuring the stability and reliability of subsequent regression model estimation.

4.4. Multiple Linear Regression Analysis

MLR is conducted with overall AI literacy as the dependent variable and all demographic, environmental, and psychological variables as independent variables. The full regression model is statistically significant ($F = 38.624$, $p < 0.001$, $R^2 = 0.428$), indicating that the selected variables collectively explain 42.8% of the variance in Vietnamese university students' AI literacy. Specifically, gender ($\beta = 0.113$, $p < 0.05$), major type ($\beta = 0.186$, $p < 0.001$), curriculum support ($\beta = 0.224$, $p < 0.001$), resource guarantee ($\beta = 0.197$, $p < 0.001$), AI learning experience ($\beta = 0.251$, $p < 0.001$), and AI perceived value ($\beta = 0.218$, $p < 0.001$) serve as significant positive predictors. Grade level shows no significant predictive effect ($p > 0.05$). The MLR results preliminarily validate most research hypotheses and confirm the multi-factor predictive mechanism of AI literacy.

4.5. Hierarchical Regression Analysis

Three nested hierarchical regression models are constructed to clarify the hierarchical contribution and incremental explanatory power of different variable layers. The detailed model fitting results are shown in Table 3.

Table 3. *Results of Hierarchical Regression Analysis for AI Literacy (N = 428).*

Variables	Model 1 β	Model 2 β	Model 3 β	p-value
Control Variables				
Gender	0.121*	0.118*	0.113*	< 0.05
Grade Level	0.042	0.039	0.035	> 0.05
Major Type	0.192***	0.189***	0.186***	< 0.001

Variables	Model 1 β	Model 2 β	Model 3 β	p-value
Environmental Variables				
Curriculum Support	–	0.231***	0.224***	< 0.001
Resource Guarantee	–	0.202***	0.197***	< 0.001
Teacher Guidance	–	0.154**	0.149**	< 0.01
Psychological Variables				
AI Learning Experience	–	–	0.251***	< 0.001
AI Perceived Value	–	–	0.218***	< 0.001
Model Fit Indices				
R^2	0.124	0.311	0.428	–
ΔR^2	–	0.187	0.117	< 0.001
F-value	12.357***	29.842***	38.624***	< 0.001

Note. *p < 0.05, **p < 0.01, ***p < 0.001; β = standardized regression coefficient

Model 1 (Control Variable Model): Model 1 only incorporates demographic variables and reaches statistical significance ($F = 12.357$, $p < 0.001$, $R^2 = 0.124$). Demographic variables explain 12.4% of AI literacy variance. Gender and major type significantly positively predict AI literacy, while grade level has no significant effect, which partially supports H1.

Model 2 (Environmental Variable Model): Based on Model 1, campus environmental variables are added. The model fitness improves significantly ($F = 29.842$, $p < 0.001$, $R^2 = 0.311$). The ΔR^2 of 0.187 ($p < 0.001$) indicates that campus environmental factors additionally explain 18.7% of AI literacy variance after controlling demographic variables, fully verifying H2. Curriculum support and resource guarantee are the most powerful environmental predictors, followed by teacher guidance.

Model 3 (Full Variable Model): Individual psychological variables are further added in Model 3. The full model achieves optimal fitting effect ($F = 38.624$, $p < 0.001$, $R^2 = 0.428$). The ΔR^2 of 0.117 ($p < 0.001$) demonstrates that psychological factors contribute an additional 11.7% explanatory variance, which supports H3. However, contrary to H4, campus environmental factors present stronger incremental explanatory power than individual psychological factors, indicating that external campus environment serves as the dominant driving factor for Vietnamese students' AI literacy development.

5. Discussion

5.1. Current Structural Characteristics of Students' AI Literacy

The empirical results confirm that Vietnamese university students exhibit moderate overall AI literacy with prominent dimensional imbalance. Students perform well in basic AI cognition due to the popularization of AI public knowledge and university basic popular science education. However, the low scores in AI ethical awareness and innovative application competence reflect the structural defects of current AI education in Vietnamese universities. Existing university AI courses primarily focus on theoretical knowledge and basic operational training, while neglecting ethical risk education and practical innovative training. Insufficient intelligent teaching resources and limited practical platforms further restrict students' ability to apply AI technologies to professional innovation and practical problem-solving. This structural differentiation feature clarifies the key weak links of student AI literacy development and corrects the one-sided cognition of overall literacy level in previous local studies.

5.2. Hierarchical Influencing Mechanism of AI Literacy

Demographic variables constitute the basic foundation of AI literacy differences. Male students and science and engineering students show higher AI literacy levels, which is consistent with international mainstream findings. Males demonstrate higher technological acceptance and learning initiative, while science and engineering students possess inherent technical knowledge reserves, facilitating AI competency improvement. The non-significant effect of grade level is attributable to the lack of progressive hierarchical AI education systems in Vietnamese universities, where students of different grades receive homogeneous educational resources and training intensity.

Campus environmental factors are the core external driving force of AI literacy improvement. The highest incremental explanatory power of campus environment indicates that uneven

educational resource allocation and imperfect curriculum systems are the primary bottlenecks restricting student AI literacy development. Systematic curriculum setting, sufficient intelligent resources, and professional teacher guidance provide continuous external support for student AI learning. For Vietnamese universities in the initial stage of AI education, institutional environmental construction plays a more decisive role in literacy improvement than individual subjective factors.

Individual psychological factors are vital internal driving factors of autonomous competency development. Positive AI learning experience and value perception can effectively stimulate students' autonomous learning motivation and form a virtuous learning cycle. Nevertheless, the relatively lower incremental contribution of psychological factors suggests that Vietnamese students' AI learning currently relies heavily on institutional environmental supply, and individual subjective initiative has not been fully mobilized. Students lack spontaneous AI learning behavior and independent innovative exploration awareness.

5.3. Theoretical and Practical Implications

Theoretically, this study constructs a three-layer hierarchical influencing mechanism model of AI literacy suitable for emerging economies, clarifies the differential incremental contribution of demographic, environmental, and psychological factors, and supplements regional empirical data for Southeast Asian AI literacy research. It expands the applicable boundary of social cognitive theory in the field of intelligent education and provides a new analytical framework for cross-national comparative research.

Practically, targeted optimization strategies are proposed for Vietnamese higher AI education. First, universities should optimize the AI curriculum system, increase ethical education and innovative practical courses to make up for structural literacy deficiencies. Second, balance the allocation of intelligent teaching resources, strengthen teacher AI professional training, and narrow the environmental gap between different universities. Third, strengthen student AI value guidance, create a positive campus AI learning atmosphere, and stimulate individual autonomous learning motivation, so as to build an internal and external collaborative literacy cultivation mechanism.

6. Conclusion and Limitations

6.1. Core Conclusions

Based on MLR and hierarchical regression analysis, this study systematically investigates the current status and hierarchical influencing factors of AI literacy among Vietnamese university students. Four core conclusions are summarized as follows. First, Vietnamese university students achieve a moderate overall AI literacy level with obvious dimensional imbalance, and ethical awareness and innovative application are the prominent weak dimensions. Second, gender, major type, campus AI learning environment, individual AI learning experience, and perceived AI value are significant positive predictors of AI literacy, while grade level has no significant predictive effect. Third, campus environmental factors possess the strongest incremental explanatory power for AI literacy, followed by individual psychological factors and demographic factors. Fourth, external campus educational environment is the dominant restrictive factor for AI literacy development among Vietnamese university students at this stage.

6.2. Research Limitations

This study has several limitations. First, the cross-sectional design cannot infer strict causal relationships between variables, failing to reflect the dynamic development trend of student AI literacy. Second, the sample only covers comprehensive universities, without including vocational and technical universities, which may limit the universality of research conclusions. Third, this study only explores the direct predictive effect of variables and does not involve mediating or moderating mechanisms, lacking in-depth exploration of complex internal action paths.

6.3. Future Research Prospects

Future research can be expanded in three directions. First, longitudinal tracking design can be adopted to explore the dynamic development and causal mechanism of student AI literacy. Second, mediating and moderating variables can be introduced to construct a more complex multi-path influencing model. Third, cross-national comparative research among Southeast Asian countries can be carried out to summarize universal rules of AI literacy development in emerging economies and provide broader references for regional intelligent higher education reform.

Conflicts of Interest

The authors declare no conflicts of interest.

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