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Examining the Impact of Artificial Intelligence Integration in ESP Tourism and Hospitality Education on Students' Critical Thinking Skills

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A B S T R A C T

Artificial Intelligence (AI) integration such as ChatGPT, Grammarly, QuillBot, AI-based language learning platforms, and automated feedback applications has become increasingly important in higher education, particularly in English for Specific Purposes (ESP) tourism and hospitality learning. However, limited studies have specifically examined the influence of AI integration on students' critical thinking skills in ESP tourism contexts. This study aimed to investigate AI integration influences students' critical thinking skills in ESP tourism and hospitality education. The study employed a quantitative descriptive design involving 113 students of tourism study program selected through purposive sampling. Data were collected using questionnaires and analyzed through validity, reliability, and simple linear regression analyses using SPSS 25. The findings revealed that AI integration significantly influenced students' critical thinking skills with an R Square value of 0.360 and significance level of 0.000. The study concludes that AI integration positively contributes to students' critical thinking development in ESP tourism.

Keywords: *ESP, AI, Critical Thinking*

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INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has brought significant transformation to higher education, including the teaching and learning of English for Specific Purposes (ESP). In the context of tourism and hospitality education, ESP learning is not merely directed toward developing students' linguistic competence, but also toward fostering critical thinking skills required to address authentic situations in the service industry, which is characterized by complexity, dynamism, and problem-solving orientation. The emergence of AI-powered technologies, particularly natural language processing tools , offers new opportunities to support more adaptive, personalized, and contextualized learning experiences. Through AI integration, students are able to access instant feedback, interactive simulations, and authentic communication practices that may enhance both language acquisition and higher-order thinking processes.

The integration and adoption of AI in ESP tourism and hospitality education can be theoretically explained through the Technology Acceptance Model proposed by Fred D. Davis (1989). The model emphasizes that technology adoption is primarily influenced by perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention to use (BI). Within tourism and hospitality ESP learning, AI adoption reflects how students perceive AI technologies as beneficial for improving communication competence, accelerating language understanding, and supporting industry-oriented digital learning. In addition, the ease of AI utilization in hotel service dialogue practices and ESP assignments contributes to students'

willingness to continuously use AI tools for future professional preparation in the global tourism industry.

Recent studies have demonstrated that AI integration in education contributes positively to learning efficiency, accessibility of information, and the quality of academic interaction among students. Research conducted by Suwahyu et al. revealed that students generally exhibit positive perceptions toward the implementation of AI in learning environments, particularly in terms of academic support and work readiness (Suwahyu et al., 2025). Nevertheless, the study also identified several challenges related to digital literacy, ethical awareness, and curriculum integration. In language learning contexts, previous literature has further emphasized that technology-enhanced collaborative learning, including the utilization of AI-based applications , can significantly improve students' engagement, participation, and learning quality (Fitri et al., 2025). These findings indicate that AI has the potential to become an innovative pedagogical tool capable of transforming ESP instruction into a more interactive and learner-centered process.

Despite its potential benefits, the implementation of AI in education also raises concerns regarding the possible decline of students' critical thinking abilities when technology is used passively and unreflectively. Several scholars argue that excessive dependence on AI-generated responses may weaken students' independent reasoning, analytical capacity, and evaluative judgment. Instead of critically processing information, students may become overly reliant on instant outputs provided by AI systems, thereby reducing opportunities for cognitive engagement and reflective thinking. Consequently, the integration of AI into educational settings requires empirical investigation to determine whether it genuinely supports or potentially hinders the development of critical thinking skills among learners (Ramadhan et al., 2025; Sukmantara, 2024).

The concept of critical thinking in this study is grounded in the Delphi Critical Thinking Framework developed by Peter A. Facione. According to the framework, critical thinking encompasses several cognitive dimensions, namely interpretation, analysis, evaluation, inference, and self-regulation (Facione, 2015). In ESP tourism and hospitality education, these dimensions are highly relevant to authentic professional communication and sustainable service practices. Interpretation refers to students' ability to understand guests' needs before responding in English communication contexts. Analysis involves students' capability to examine hospitality service case studies logically and systematically. Evaluation reflects students' competence in assessing whether AI-generated responses align with sustainable hospitality service standards.

Critical thinking is considered an essential competence in the tourism and hospitality industry because professionals are required to respond effectively to dynamic customer needs, multicultural interactions, and unpredictable service situations. Employees in this industry must be capable of analyzing problems, making quick and accurate decisions, evaluating service quality, and providing appropriate solutions to maintain customer satisfaction. In addition, the rapid digital transformation within the global tourism sector demands hospitality professionals who are adaptable, innovative, and able to assess information critically in technology-supported environments. Therefore, tourism and hospitality students need to develop higher-order thinking skills not only to improve communication performance in ESP learning, but also to prepare themselves for real-world professional challenges that require problem-solving, creativity, collaboration, and decision-making abilities.

Within the field of ESP for tourism and hospitality, studies specifically examining the relationship between AI integration and students' critical thinking skills remain limited. Most previous research has primarily focused on students' writing performance, language proficiency, or general perceptions toward AI utilization. For instance, Hanane investigated the use of ChatGPT in improving ESP students' writing abilities; however, the study did not explicitly address critical thinking as a primary variable (Hanane, 2023). This indicates the existence of a significant research gap concerning the pedagogical implications of AI integration in fostering higher-order cognitive skills within ESP learning environments.

Considering the growing importance of critical thinking in the tourism and hospitality industry, where professionals are expected to make quick decisions, solve customer-related problems, and communicate effectively in multicultural settings, investigating the educational impact of AI becomes increasingly relevant. Tourism and hospitality students must not only understand language structures and industry-specific vocabulary, but also demonstrate analytical thinking, creativity, adaptability, and problem-solving competence. Therefore, understanding how AI integration influences students' critical thinking skills is essential for designing effective ESP instructional models that align with the demands of the modern hospitality industry and the digital transformation era.

Based on the aforementioned issues, this study aims to examine the impact of Artificial Intelligence integration in ESP tourism and hospitality education on students' critical thinking skills. Specifically, this research seeks to answer the following research question: To what extent does the integration of Artificial Intelligence in ESP tourism and hospitality education influence students' critical thinking skills? In line with this research question, the study proposes the following hypothesis: *H_1: The integration of Artificial Intelligence in ESP tourism and hospitality education has a significant positive effect on students' critical thinking skills. Meanwhile, the null hypothesis is formulated as follows: H_0: The integration of Artificial Intelligence in ESP tourism and hospitality education does not have a significant effect on students' critical thinking skills.*

The findings of this research are expected to contribute theoretically to the development of technology-enhanced ESP pedagogy and practically to provide insights for educators, curriculum developers, and higher education institutions in integrating AI effectively and responsibly within tourism and hospitality education.

METHOD

Research Design

This study employed a quantitative descriptive research design to examine the impact of Artificial Intelligence (AI) integration in English for Specific Purposes (ESP) tourism and hospitality education on students' critical thinking skills. Quantitative descriptive research was considered appropriate because the study aimed to measure the relationship between the independent variable, namely AI integration in ESP learning, and the dependent variable, namely students' critical thinking skills, through statistical analysis. The research further utilized simple regression analysis to determine the extent to which AI integration significantly influenced students' critical thinking abilities.

Respondents

The respondents of this study consisted of 113 students enrolled in tourism and hospitality-related study programs in Riau Islands. The participants were selected using purposive sampling techniques based on several predetermined criteria. First, the respondents had to be active students in semesters 2, 4, and 6. Second, they must have completed at least a basic ESP course related to tourism and hospitality. Third, the respondents were required to have experience using AI-based learning tools, or similar applications, in supporting their academic learning activities.

The selection of students from different semester levels was intended to obtain more representative data regarding students' experiences and perceptions toward AI integration in ESP learning. Students in semester 2 were assumed to possess foundational ESP learning experiences, while students in semesters 4 and 6 were considered to have broader exposure to ESP practices and academic tasks requiring higher-order thinking skills. Therefore, involving respondents from multiple academic levels enabled the study to capture a more comprehensive understanding of the relationship between AI utilization and critical thinking development.

Demographically, the respondents were between 19 and 21 years old and consisted of both male and female students. The participants were drawn from hospitality and tourism study programs at higher education institutions in the Riau Islands. The inclusion of students from semesters 2 until semester 6 was intended to obtain more representative data regarding

students' experiences and perceptions toward AI integration in ESP learning. Students in semester 2 were assumed to possess foundational ESP learning experiences, while students in semesters 4 and 6 were considered to have broader exposure to ESP practices and academic tasks requiring higher-order thinking skills. Therefore, involving respondents from multiple academic levels enabled the study to capture a more comprehensive understanding of the relationship between AI utilization and critical thinking development.

Research Instruments

The primary instrument used in this study was a structured questionnaire administered to the respondents. The questionnaire was developed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument was constructed based on two major theoretical frameworks: the Technology Acceptance Model developed by Fred D. Davis and the Delphi Critical Thinking Framework proposed by Peter A. Facione (Davis, 1985; Facione, 2015).

The independent variable (X), namely AI Integration/Adoption in ESP Tourism and Hospitality Learning, was measured using dimensions adapted from the Technology Acceptance Model (TAM), including perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention to use (BI). The questionnaire mapping for Variable X is presented as follows:

Table 1. Questionnaire Mapping Variable X

Dimension	Questionnaire Indicators
Perceived Usefulness (PU)	AI helps me understand English for Tourism more quickly.
	AI improves the quality of my professional hospitality communication.
	AI supports digital industry-based tourism learning.
Perceived Ease of Use (PEOU)	AI tools are easy to use in hotel service dialogue practices.
	I do not experience difficulties integrating AI into ESP assignments.
Behavioral Intention to Use (BI)	I will continue using AI for global tourism career preparation.
	I recommend AI as an innovation in hospitality learning.

Meanwhile, the dependent variable (Y), namely Critical Thinking Skills in ESP Tourism and Hospitality Learning, was measured using dimensions derived from the Delphi Critical Thinking Framework. The dimensions included interpretation, analysis, evaluation, inference, and self-regulation. The questionnaire mapping for Variable Y is presented below:

Table 2. Questionnaire Mapping Variable Y

Dimension	Questionnaire Indicators
Interpretation	I understand guests' needs before responding in English.
Analysis	I am able to analyze hotel service problem case studies logically.
Evaluation	I evaluate whether AI-generated responses align with sustainable hospitality service standards.
Inference	I can draw the best conclusions for solving eco-tourism issues.
Self-Regulation	I recheck AI-generated outputs to avoid misleading professional communication.

Prior to the main data collection, the questionnaire underwent validity and reliability testing to ensure the quality and consistency of the instrument. Content validity was evaluated through expert judgment involving lecturers in ESP and educational technology. Furthermore, empirical validity testing was conducted using Pearson Product Moment correlation analysis. Questionnaire items were considered valid if the correlation coefficient exceeded the critical value at the significance level of 0.05. Reliability testing was conducted using Cronbach's Alpha coefficient to determine the internal consistency of the instrument. A Cronbach's Alpha value greater than 0.70 indicated that the questionnaire possessed acceptable reliability and was suitable for data collection purposes.

Data Collection Procedure

The data were collected through online questionnaire distribution conducted during the academic semester. Prior to completing the questionnaire, respondents were informed about the purpose of the study and assured that their responses would remain confidential and be used solely for academic research purposes. Participation in this study was voluntary, and respondents were allowed to withdraw at any stage of the research process.

Data Analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. The analysis process consisted of several stages. First, descriptive statistical analysis was conducted to describe the respondents' demographic characteristics and the general distribution of responses regarding AI integration and critical thinking skills. Descriptive statistics included mean scores, percentages, frequencies, and standard deviations. Second, validity and reliability analyses were performed to evaluate the quality of the research instrument. Validity testing employed Pearson Product Moment correlation, while reliability analysis utilized Cronbach's Alpha coefficient. Third, prerequisite tests were conducted before hypothesis testing, including normality and linearity tests, to ensure that the data met the assumptions required for regression analysis. Finally, the research hypothesis was examined using simple linear regression analysis to determine whether AI integration in ESP tourism and hospitality education significantly influenced students' critical thinking skills. The regression analysis measured the strength and direction of the relationship between the independent and dependent variables. The hypothesis was accepted if the significance value (p-value) was lower than 0.05, indicating a statistically significant effect of AI integration on students' critical thinking skills.

FINDINGS AND DISCUSSION

This section presents the findings of the study regarding the impact of Artificial Intelligence (AI) integration in ESP tourism and hospitality education on students' critical thinking skills. The findings were obtained from questionnaire responses collected from 113 students in Riau Islands who had previously completed basic ESP courses and experienced the use of AI-assisted learning tools in their academic activities. The analysis was conducted quantitatively using the Statistical Package for the Social Sciences (SPSS) through several stages, including descriptive statistical analysis, validity testing, reliability testing, prerequisite analysis, and simple linear regression analysis.

The findings are organized systematically to provide a comprehensive understanding of the research results. The first part presents the results of the instrument validity and reliability tests to ensure that the questionnaire items accurately and consistently measured the research variables. The second part describes the respondents' perceptions regarding the integration of Artificial Intelligence in ESP tourism and hospitality learning as well as their critical thinking skills. The final part discusses the hypothesis testing results through simple regression analysis to determine whether AI integration significantly influences students' critical thinking skills in ESP tourism and hospitality education contexts.

The validity test in this study was conducted to determine the extent to which the questionnaire items were capable of accurately measuring the intended research variables. According to Sugiyono, an instrument is considered valid when the items within the questionnaire are able to measure the concept or construct being studied appropriately (Sugiyono, 2019). Furthermore, validity also refers to the accuracy and precision of an instrument in measuring research variables. In this study, the validity analysis was performed using Pearson Product Moment correlation analysis by comparing the calculated correlation value (r-count) with the critical value of the correlation table (r-table) at a significance level of 0.05. Based on the sample size of 113 respondents, the r-table value was determined to be 0.184. Questionnaire items were considered valid when the r-count value exceeded the r-table value and the significance value was lower than 0.05.

The validity test results for Variable X, namely Artificial Intelligence Integration/Adoption in ESP Tourism and Hospitality Learning, indicated that all questionnaire items were valid. The findings showed that the r-count values ranged from 0.399 to 1.000, all of which exceeded the r-table value of 0.184. Furthermore, all items obtained significance values of 0.000, which were lower than the significance threshold of 0.05. The highest validity coefficient was found in item 15 with an r-count value of 1.000, while the lowest coefficient was identified in item 10 with an r-count value of 0.399. Nevertheless, since all values remained above the minimum criterion, all items were declared statistically valid. These findings demonstrate that the questionnaire items measuring AI integration were capable of accurately representing the dimensions of perceived usefulness, perceived ease of use, and behavioral intention to use as proposed in the Technology Acceptance Model developed by Fred D. Davis.

Table 3. Validity Analysis Variable X

Question Number	Calculated R-value	R-table Value	Significance Value	Description
1	0,415	0,184	0	Valid
2	0,412	0,184	0	Valid
3	0,533	0,184	0	Valid
4	0,412	0,184	0	Valid
5	0,510	0,184	0	Valid
6	0.499	0,184	0	Valid
7	0,421	0,184	0	Valid
8	0,474	0,184	0	Valid
9	0,527	0,184	0	Valid
10	0,399	0,184	0	Valid
11	0,458	0,184	0	Valid
12	0,607	0,184	0	Valid
13	0,532	0,184	0	Valid
14	0,607	0,184	0	Valid
15	1	0,184	0	Valid

Moreover, the validity results indicate that the instrument successfully captured students' perceptions regarding the implementation of AI technologies in ESP tourism and hospitality learning. The relatively moderate to strong correlation values suggest that each questionnaire item contributed meaningfully to the overall construct measurement. The findings also confirm that the instrument was suitable for assessing students' acceptance and adoption of AI tools in educational settings. Therefore, the Variable X instrument fulfilled the statistical requirements for validity and could be utilized for further analysis in examining the relationship between AI integration and students' critical thinking skills.

Similarly, the validity test conducted for Variable Y, namely Critical Thinking Skills in ESP Tourism and Hospitality Learning, demonstrated that all questionnaire items were statistically valid. The r-count values ranged from 0.292 to 1.000, all exceeding the r-table value of 0.184. In addition, all questionnaire items obtained significance values of 0.000, indicating that each item had a statistically significant correlation with the total score. The highest validity coefficient was found in item 15 with an r-count value of 1.000, whereas the lowest coefficient appeared in item 3 with an r-count value of 0.292. Despite the variation in correlation strength, all items satisfied the validity requirements and were therefore considered appropriate for measuring students' critical thinking skills.

Table 4. Validity Analysis Variable Y

Question Number	Calculated R-value	R-table Value	Significance Value	Description
1	0,479	0,184	0	Valid
2	0,416	0,184	0	Valid
3	0,292	0,184	0	Valid
4	0,394	0,184	0	Valid

5	0,573	0,184	0	Valid
6	0,372	0,184	0	Valid
7	0,413	0,184	0	Valid
8	0,302	0,184	0	Valid
9	0,379	0,184	0	Valid
10	0,322	0,184	0	Valid
11	0,374	0,184	0	Valid
12	0,476	0,184	0	Valid
13	0,530	0,184	0	Valid
14	0,581	0,184	0	Valid
15	1	0,184	0	Valid

The validity findings for Variable Y further indicate that the questionnaire items were capable of representing the dimensions of critical thinking proposed in the Delphi Critical Thinking Framework developed by Peter A. Facione, including interpretation, analysis, evaluation, inference, and self-regulation. The results demonstrate that the instrument accurately measured students' abilities to analyze problems, evaluate AI-generated responses, interpret hospitality communication contexts, and perform reflective judgment in ESP learning activities. Consequently, both Variable X and Variable Y instruments met the validity criteria and were deemed appropriate for subsequent statistical analyses, including reliability testing and hypothesis testing through regression analysis.

Table 5. Reliability Statistics Variable X

Cronbach's Alpha	N of Items
.939	15

The reliability test for Variable X at Table 3, namely Artificial Intelligence Integration/Adoption in ESP Tourism and Hospitality Learning, was conducted to examine the consistency and stability of the research instrument. Reliability refers to the consistency of a research instrument in measuring a particular variable repeatedly under similar conditions (Sugiyono, 2019). A reliable instrument produces stable and dependable results, indicating that the questionnaire items consistently measure the intended construct. In this study, reliability analysis was carried out using Cronbach's Alpha coefficient through the Statistical Package for the Social Sciences (SPSS). An instrument is generally considered reliable when the Cronbach's Alpha value exceeds 0.70.

Based on the reliability test results, Variable X obtained a Cronbach's Alpha coefficient of 0.939 from 15 questionnaire items. This value is significantly higher than the minimum reliability criterion of 0.70, indicating that the instrument possesses a very high level of internal consistency. The findings suggest that all questionnaire items measuring the dimensions of perceived usefulness, perceived ease of use, and behavioral intention to use AI consistently represented the construct of AI integration in ESP tourism and hospitality learning. Therefore, the Variable X instrument was categorized as highly reliable and suitable for further statistical analyses, including regression analysis and hypothesis testing. The high reliability coefficient also indicates that the questionnaire items were well-structured and capable of generating stable measurement results across respondents.

Table 6. Reliability Statistics Variable Y

Cronbach's Alpha	N of Items
.937	15

The reliability test for Variable Y at Table 4, namely Critical Thinking Skills in ESP Tourism and Hospitality Learning, was conducted to determine the consistency and dependability of the questionnaire items in measuring the intended construct. In this study, reliability analysis was performed using Cronbach's Alpha coefficient with the assistance of the Statistical Package for the Social Sciences (SPSS). A questionnaire is generally considered reliable if the Cronbach's Alpha value exceeds 0.70.

Based on the reliability test results at Table 4, Variable Y obtained a Cronbach's Alpha coefficient of 0.937 from 15 questionnaire items. This value is substantially higher than the required reliability threshold of 0.70, indicating that the instrument has a very high level of internal consistency. The findings demonstrate that the questionnaire items consistently measured the dimensions of critical thinking, including interpretation, analysis, evaluation, inference, and self-regulation, as proposed in the Delphi Critical Thinking Framework developed by Peter A. Facione, Therefore, the Variable Y instrument was categorized as highly reliable and appropriate for further statistical analyses, including regression analysis and hypothesis testing. The high Cronbach's Alpha value also indicates that the questionnaire items were well-designed and capable of producing stable and dependable responses from the respondents.

Table 7. Model Summary Simple Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.600[a]	.360	.354	6.291

a. Predictors: (Constant), Integrasi AI ESP

The simple linear regression analysis was conducted to determine the extent to which Artificial Intelligence (AI) integration in ESP tourism and hospitality learning influenced students' critical thinking skills. Simple linear regression analysis is used to examine the relationship and predictive influence of one independent variable on one dependent variable. It explains that the coefficient of determination (R Square) indicates how much variance in the dependent variable can be explained by the independent variable. Based on the regression analysis results, the correlation coefficient (R) was found to be 0.600, indicating a moderate to strong positive relationship between AI integration in ESP learning and students' critical thinking skills. This finding suggests that the higher the level of AI integration in ESP tourism and hospitality education, the higher the students' critical thinking abilities tend to be.

Furthermore, the coefficient of determination (R Square) which being displayed on Table 5, obtained in this study was 0.360, which indicates that 36.0% of the variance in students' critical thinking skills could be explained by the integration of AI in ESP learning. Meanwhile, the remaining 64.0% was influenced by other variables outside the scope of this study. The Adjusted R Square value of 0.354 further confirms the consistency of the regression model in explaining the relationship between the variables. In addition, the Standard Error of the Estimate value was 6.291, indicating the level of prediction error within the regression model. Overall, the regression findings demonstrate that AI integration has a meaningful contribution to the development of students' critical thinking skills in ESP tourism and hospitality education. These findings support the Technology Acceptance Model proposed by Fred D. Davis, which emphasizes that effective technology adoption can positively influence learning outcomes and students' cognitive engagement.

Table 8. ANOVA[a] Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2470.024	1	2470.024	62.410	.000[b]
	Residual	4393.109	111	39.578		
	Total	6863.133	112			

Dependent Variable: Berpikir Krits
Predictors: (Constant), Integrasi AI ESP

The ANOVA test in simple linear regression analysis at Table 6 above was conducted to determine whether the regression model used in this study was statistically significant in explaining the influence of Artificial Intelligence (AI) integration in ESP tourism and hospitality learning on students' critical thinking skills. According to Ghozali, the ANOVA test in regression analysis functions to evaluate the overall feasibility of the regression model by examining whether the independent variable simultaneously contributes significantly to the dependent variable. Similarly, Sugiyono explains that the significance value in ANOVA

testing is used as the basis for determining whether the proposed regression model can be accepted for hypothesis testing. If the significance value is lower than 0.05, the regression model is considered statistically significant (Sugiyono, 2019).

Based on the ANOVA results, the regression model produced an F-value of 62.410 with a significance value of 0.000. Since the significance value was lower than the predetermined significance level of 0.05, the regression model was declared statistically significant. This finding indicates that the independent variable, namely AI integration in ESP tourism and hospitality learning, significantly influences the dependent variable, namely students' critical thinking skills. Furthermore, the regression sum of squares value was 2470.024, while the residual sum of squares was 4393.109, resulting in a total sum of squares of 6863.133. These findings demonstrate that a substantial proportion of the variation in students' critical thinking skills can be explained by the implementation of AI integration within ESP learning activities.

The results of the ANOVA analysis further confirm that the proposed research hypothesis is accepted, meaning that AI integration has a significant positive effect on students' critical thinking skills in ESP tourism and hospitality education. The significant F-value indicates that the regression equation developed in this study is appropriate for predicting the relationship between the two variables. These findings are consistent with the Technology Acceptance Model proposed by (Davis, 1985), which emphasizes that the effective adoption of technology can improve learning performance and cognitive engagement among learners (Davis, 1985). Therefore, the integration of AI technologies such as ChatGPT in ESP tourism and hospitality learning can be considered an influential educational innovation that supports the development of higher-order thinking skills, particularly critical thinking.

Discussion

The Influence of Artificial Intelligence Integration on Students' Critical Thinking Skills

The findings of this study revealed that the integration of Artificial Intelligence (AI) in ESP tourism and hospitality education has a significant positive effect on students' critical thinking skills. This result is evidenced by the regression analysis showing a correlation coefficient (R) of 0.600 and a coefficient of determination (R Square) of 0.360, indicating that AI integration contributed 36% toward the improvement of students' critical thinking skills. In addition, the ANOVA test demonstrated a significance value of 0.000, which was lower than the significance threshold of 0.05. Therefore, the alternative hypothesis (H_1) stating that AI integration significantly influences students' critical thinking skills was accepted, while the null hypothesis (H_0) was rejected. These findings indicate that AI technologies can function as effective learning tools in promoting higher-order thinking processes among ESP tourism and hospitality students.

The findings support the Technology Acceptance Model proposed by Fred D. Davis, which emphasizes that users are more likely to adopt technology when they perceive it as useful and easy to use (Davis, 1985). In the context of this study, students perceived AI as beneficial in supporting communication practices, analyzing hospitality case studies, generating ideas, and improving problem-solving activities during ESP learning. As a result, AI adoption encouraged more interactive and reflective learning experiences that stimulated students' analytical reasoning and evaluative thinking. These findings are consistent with recent studies demonstrating that AI-assisted learning environments positively influence students' cognitive engagement and reflective inquiry processes (Nasr et al., 2025).

Furthermore, the results align with previous research conducted by Aprianto, which found that the use of AI-based ChatGPT significantly improved students' critical thinking and problem-solving skills in higher education contexts (Aprianto et al., 2025). The study emphasized that AI integration becomes more effective when implemented within guided and reflective learning frameworks rather than through passive usage. Similarly, Harahap reported that the integration of ChatGPT in educational environments enhanced students' ability to analyze complex situations, evaluate information critically, and make logical decisions (Sagita Harahap, 2024). These similarities indicate that AI can support students'

cognitive development when educators design meaningful and inquiry-based learning activities.

AI Integration and Critical Thinking in ESP Tourism and Hospitality Education

In ESP tourism and hospitality learning, critical thinking plays a central role because students are required to communicate effectively, solve customer-related problems, and make professional decisions in multicultural and dynamic service environments. The findings of this study indicate that AI integration supports these competencies by enabling students to engage in authentic communication simulations, evaluate AI-generated hospitality responses, and reflect critically on sustainable tourism practices. The dimensions of critical thinking adopted from the Delphi Critical Thinking Framework developed by (Facione, 1990), namely interpretation, analysis, evaluation, inference, and self-regulation, were positively reflected in students' responses throughout the learning process.

The findings further suggest that AI integration in ESP learning contributes to students' ability to interpret guests' needs, analyze hospitality-related problems logically, and evaluate the appropriateness of AI-generated responses according to sustainable tourism standards. These findings are highly relevant to the demands of the tourism and hospitality industry, where employees are expected to demonstrate adaptability, problem-solving competence, and critical decision-making abilities. Recent literature has also emphasized that generative AI technologies can improve cognitive presence and reflective learning when integrated with collaborative and inquiry-based pedagogical approaches. Nasr et al. highlighted that AI chatbots support analytical engagement and reflective discourse within educational environments, thereby strengthening students' critical thinking development (Nasr et al., 2025).

Challenges and Ethical Concerns of AI Utilization in Higher Education

Despite the positive findings, this study also acknowledges the growing concerns regarding excessive dependence on AI technologies in educational settings. Several scholars have argued that uncritical reliance on generative AI tools may reduce students' independent reasoning and analytical engagement. (Hikmah & Walida, 2024; Salido et al., 2025; Sujannah et al., 2025) Some studies emphasize that students who depend entirely on AI-generated outputs may experience cognitive offloading, where intellectual effort is replaced by automated responses. This concern is particularly important in higher education because critical thinking development requires reflective inquiry, argument evaluation, and independent judgment (Maldin, 2026; McCann & Sweeney, 2025; Speri, 2026).

However, the findings of this study indicate that AI does not necessarily weaken critical thinking when used appropriately within guided instructional frameworks. Instead, AI can serve as a catalyst for reflective learning by encouraging students to verify information, compare alternative responses, and evaluate the credibility of generated content. This supports the concept of AI literacy, which emphasizes students' ability not only to use AI tools but also to critically assess and ethically manage AI-generated information. Recent studies on AI literacy highlight the importance of combining technological competence with evaluative and ethical thinking skills in higher education (Krause et al., n.d.; Mcdonald et al., n.d.).

Therefore, educators in ESP tourism and hospitality programs should integrate AI strategically by designing learning activities that encourage discussion, reflection, problem-solving, and critical evaluation rather than passive content consumption. AI should function as a complementary educational tool instead of replacing students' reasoning processes. In this regard, the findings of the present study reinforce the argument that the effectiveness of AI integration depends largely on pedagogical design, lecturer guidance, and students' critical awareness in utilizing AI technologies responsibly.

Implications for ESP Tourism and Hospitality Education

The findings of this study have several important implications for ESP tourism and hospitality education. First, the significant positive relationship between AI integration and

students' critical thinking skills suggests that higher education institutions should consider integrating AI technologies systematically into ESP curricula. AI tools can be utilized to facilitate role-play simulations, hospitality case analyses, personalized language feedback, and interactive communication practices that align with industry needs. Such integration can create more student-centered, learning autonomy and technology-enhanced learning environments that promote both metacognitive, linguistic competence and higher-order thinking skills (Maldin, 2026).

Second, lecturers need to develop pedagogical strategies that balance technological innovation with reflective learning practices. The use of AI should encourage students to question, analyze, evaluate, and verify information rather than merely accepting AI-generated outputs. This pedagogical approach is particularly important in tourism and hospitality education, where professionals are expected to demonstrate ethical judgment, communication competence, and problem-solving skills in real-world situations. Recent literature emphasizes that AI-enhanced education should focus on developing cognitive engagement, collaborative learning, and critical inquiry rather than solely improving efficiency and automation.(Miah et al., 2024; Salido et al., 2025).

Finally, the findings contribute theoretically to the growing body of research on AI integration in ESP learning and critical thinking development. The study expands previous literature by specifically examining AI integration within tourism and hospitality education, an area that remains underexplored in existing studies. The findings also confirm that the effective adoption of AI technologies can positively support students' critical thinking development when implemented within reflective, ethical, and inquiry-based educational frameworks.

CONCLUSIONS

This study concludes that the integration of Artificial Intelligence (AI) in ESP tourism and hospitality education positively influences students' critical thinking skills. The findings indicate that AI-assisted learning contributes to the development of key critical thinking dimensions, including interpretation, analysis, evaluation, inference, and self-regulation. The results support the Technology Acceptance Model (Davis, 1989), suggesting that students are more likely to engage cognitively when technology is perceived as useful and easy to use. Beyond enhancing language learning, AI integration helps students develop essential competencies required in the tourism and hospitality industry, such as problem-solving, adaptability, digital literacy, and decision-making skills. However, the effective use of AI requires appropriate pedagogical guidance to prevent overreliance on AI-generated responses. Therefore, educators are encouraged to integrate AI through inquiry-based, reflective, and student-centered learning activities that promote analytical thinking and learner autonomy. Overall, AI serves as a valuable educational tool that supports both language development and higher-order thinking skills in ESP learning contexts.

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