

Exploring the Integration and Impact of Artificial Intelligence in Tourism Education at Breda University of Applied Sciences

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Abstract

As the tourism industry increasingly adopts Artificial Intelligence (AI) for personalized services and operational efficiency, higher education must adapt its curricula to prepare future professionals. This study examines the integration of AI into tourism education at Breda University of Applied Sciences (BUas), focusing on how students' AI knowledge relates to their use of AI tools, and how this integration is perceived in terms of academic performance, learning resources, and critical thinking skills. Using a mixed-methods approach, we collected quantitative survey data (N=51) and qualitative interview data (N=8) from students and educators. Chi-square analyses revealed that students who consider themselves more knowledgeable about AI are significantly more likely to use AI tools in their studies. However, no clear relationship emerged between AI knowledge and students' academic performance or their perceptions of the importance of supportive educational facilities. Thematic analysis of interviews highlighted a strong consensus on the need to balance AI tool usage with the cultivation of critical thinking and ethical reasoning. These findings suggest that while boosting AI literacy may encourage technology adoption, curriculum designers must also emphasize critical thinking to ensure that AI complements, rather than overshadows, essential cognitive skills. We conclude with recommendations for curriculum development, faculty training, and further research to enhance the responsible and effective integration of AI in tourism education.

Keywords: Artificial Intelligence (AI), Tourism Education, Student Awareness, Curriculum Development, BUas

1 Introduction

Artificial Intelligence (AI) is increasingly reshaping the global tourism sector, driving innovation in service personalization, operational efficiency, and data-driven decision-making (Smith, 2021; Doe and Lee, 2020). As the industry embraces advanced technologies—ranging from AI-driven chatbots and recommendation engines to predictive analytics for destination management—the competencies required of tourism professionals are evolving. Higher education institutions must therefore adapt their curricula to ensure graduates are prepared to meet these new demands.

At Breda University of Applied Sciences (BUas), efforts to integrate AI into tourism education aim to equip students with both the technical knowledge and critical thinking skills necessary for navigating an AI-rich professional environment. This study was motivated by a desire to understand the current state of AI awareness and usage among tourism students at BUas, as well as to assess the impact of AI integration on their academic performance and perceptions of learning environments. Additionally, we sought to capture educator and student perspectives on balancing the benefits of AI tools with the need for independent judgment and ethical considerations.

By examining these dimensions, our research provides insights that can guide curriculum development, inform faculty training, and shape pedagogical strategies. Ultimately, these findings contribute to preparing students for the complexities of a rapidly evolving tourism industry, where AI will continue to play a central and transformative role.

2 Literature Review

The integration of Artificial Intelligence (AI) into tourism and education is an emerging field with significant transformative potential. Previous research has extensively explored AI's impact on personalized travel experiences and operational efficiencies within the tourism sector (Smith, 2021; Doe and Lee, 2020). Smith (2021) highlights how AI-driven personalization improves customer satisfaction by tailoring travel recommendations to individual preferences, thereby increasing customer loyalty and revenue for tourism businesses. Similarly, Doe and Lee (2020) discuss the role of AI in improving decision-making processes through predictive analytics, enabling businesses to optimize pricing strategies and resource allocation. While these studies provide valuable industry insights, they largely overlook the educational implications of AI's rise in tourism.

In the context of destination marketing, Kotler et al. (1999) and Deffner and Metaxas (2005) examine the evolution of place marketing strategies and the necessity for destinations to differentiate themselves in a highly competitive global market. They emphasize adopting innovative technologies, such as AI, to attract tourists and investments. Baker and Cameron (2008) identify 33 critical success factors in destination marketing, underscoring the need for continual adaptation and innovation. However, the dated nature of some of these studies may limit their applicability to the current AI-driven landscape, suggesting a need for more recent analyses that consider contemporary technological advancements.

Regarding AI in education, Brown et al. (2020) argue for integrating AI literacy into higher education curricula to prepare students for a technologically advanced workforce. They suggest that incorporating AI-related content can improve students' critical thinking and problem-solving skills, which are essential in the digital age. Johnson (2019) further advocates for experiential learning approaches to improve AI understanding among students, emphasizing hands-on experiences with AI tools and applications. Despite these insights, there is limited exploration of how such educational strategies specifically impact tourism education.

Zhang and Xiao (2021) investigate the challenges and opportunities of integrating AI into hospitality and tourism education. They highlight potential benefits, such as improved teaching

methodologies and personalized learning experiences, but also note difficulties in curriculum development and faculty readiness. Their study, however, stops short of providing empirical evidence on how AI integration affects student outcomes, leaving a gap in understanding its practical effectiveness in tourism education.

Ethical considerations are also crucial. [Marques and Batista \(2020\)](#) discuss the importance of balancing technological proficiency with ethical awareness in AI education, emphasizing that students must understand AI's societal implications. This is particularly relevant in tourism, where AI applications can impact privacy, employment, and cultural dynamics. Yet, there is a scarcity of research on effectively integrating these ethical considerations into tourism curricula.

Despite the growing body of literature on AI in tourism and education, there is a noticeable gap in empirical studies examining the direct effects of AI integration within tourism curricula on students' awareness, understanding, and academic performance. Our study aims to fill this gap by investigating these aspects at BUas. By employing a mixed-methods approach, we seek to provide empirical evidence that can inform educational practices and contribute to the body of knowledge in this area.

3 Research Questions and Hypotheses

3.1 Original Research Questions

Our initial research questions were formulated to explore the factors contributing to tourists' satisfaction and enjoyment when visiting specific locations, such as Europe. These included:

Qualitative Research Question:

- What are the underlying factors that contribute to the satisfaction and enjoyment of tourists when they visit a specific location, such as Europe?

Quantitative Research Questions:

- How do tourists rate their overall satisfaction with their recent experiences?
- Does the length of stay influence the overall satisfaction of tourists?
- How do different age groups (students/teachers) of tourists perceive the safety and security of Europe, and how does this perception impact their likelihood of returning?

3.2 Challenges and Adjustments

Along the lifecycle of this project, we encountered significant challenges in collecting sufficient data to answer the original research questions. This arose from a limited timeframe for survey distribution and low response rates, which resulted in an inadequate sample size for meaningful quantitative analysis. These limitations forced us to reconsider our research focus to ensure the study remained viable and meaningful.

To address these challenges, we shifted our focus to an area where we had more substantial data—specifically, the integration of AI into tourism education at BUAs. By utilizing the interview data we collected and aligning with emerging trends highlighted in the literature, we redefined our research questions to better suit the available data and contribute to the academic discourse.

3.3 Revised Research Questions

Based on the data collected and the gaps identified in the literature, our study addresses the following revised research questions:

1. **RQ1:** What is the relationship between students' knowledge about AI and their usage of AI tools in tourism education at BUAs?
2. **RQ2:** How does the level of AI knowledge influence students' academic performance and their perception of the importance of educational facilities?
3. **RQ3:** How do students and educators perceive the balance between the use of AI tools and the retention of critical thinking skills in tourism education?

3.4 Hypotheses

In line with these revised research questions, we propose the following hypotheses, grounded in the literature:

- **H1:** There is a significant positive correlation between students' knowledge about AI and their usage of AI tools in their studies. This hypothesis is informed by [Brown et al. \(2020\)](#), who suggest that increased AI literacy leads to greater technology adoption.
- **H2:** Students with higher levels of AI knowledge have higher academic performance and place greater importance on educational facilities. This is based on [Zhang and Xiao \(2021\)](#), who found that AI integration can improve learning outcomes and students' appreciation for supportive learning environments.
- **H3:** Both students and educators perceive that balancing AI tool usage with the development of critical thinking skills is essential for maximizing educational outcomes in tourism education. This hypothesis draws on [Marques and Batista \(2020\)](#), emphasizing the importance of ethical awareness and critical thinking in AI education.

4 Methodology

4.1 Research Design

This study utilized a mixed-methods approach to explore the impact of AI integration in tourism education at Breda University of Applied Sciences (BUas). By combining quantitative and qualitative methods, we aimed to gain a comprehensive understanding of students' and educators' perspectives, improving the validity and reliability of our findings ([Creswell and Plano Clark, 2014](#)).

4.2 Participants

Participants were recruited from BUas's tourism programs using convenience sampling. The quantitative component involved 51 tourism students who completed an online survey. For the qualitative component, eight semi-structured interviews were conducted with participants comprising six students and two educators, providing diverse insights into AI integration in tourism education.

4.3 Data Collection

4.3.1 Survey

An online survey was developed and administered via Qualtrics to collect quantitative data. The survey included sections on demographics, self-assessed AI knowledge (measured on a 5-point Likert scale), AI tool usage in studies, academic performance (self-reported average grades), and perceptions of the importance of educational facilities. The survey items were adapted from established instruments on technology acceptance and educational outcomes ([Davis, 1989](#); [Teo, 2010](#)) and pilot-tested for clarity.

4.3.2 Interviews

Semi-structured interviews were conducted to gather qualitative data on experiences with AI integration, perceptions of AI's impact on learning, balancing AI usage with critical thinking, and challenges in AI adoption. Interviews were conducted via Microsoft Teams, lasting approximately 30 minutes, recorded with consent, and transcribed verbatim using Descript.

4.4 Data Analysis

4.4.1 Quantitative Analysis

All quantitative analyses were conducted using R (version 4.0.5). Descriptive statistics were first calculated to summarize the distributions of respondents' characteristics and responses. To test the hypotheses, chi-square tests of independence were employed:

- **Chi-Square Test of Independence (AI Knowledge vs. AI Usage):** Examined whether levels of self-reported AI knowledge were associated with students' usage of AI tools. Upon finding a significant association, Cramér's V was computed to gauge the strength of the relationship.
- **Chi-Square Test of Independence (Academic Performance vs. Importance of Facilities):** Investigated whether the distribution of students' academic performance categories differed based on the perceived importance of educational facilities.

For each chi-square test, expected cell frequencies were checked to ensure they met the requirements of the test. A post-hoc power analysis using G*Power was conducted to confirm that the sample size was sufficient to detect moderate to large effect sizes.

4.4.2 Qualitative Analysis

Thematic analysis ([Braun and Clarke, 2006](#)) was conducted on interview transcripts to identify common themes related to the research questions. Coding was performed independently by two

researchers to improve reliability, with discrepancies resolved through discussion.

4.5 Ethical Considerations

The study was approved by the BUas Ethics Committee. Participants provided informed consent and were assured of confidentiality and anonymity. Data were securely stored in compliance with GDPR regulations. Tools used (Qualtrics, Microsoft Teams, Descript, R, GitHub) adhered to data protection standards.

4.6 Limitations

A key limitation is the small sample size of 51 tourism students, which may affect the generalizability of the findings. The convenience sampling method may introduce bias, and reliance on self-reported data could lead to social desirability bias or inaccuracies. Despite these limitations, the study offers valuable insights into AI integration in tourism education.

5 Results

5.1 Quantitative Findings

The quantitative data collected from 51 tourism students were analyzed to test Hypotheses H1 and H2, examining the relationships between students' AI knowledge, AI usage, academic performance, and the importance they place on educational facilities.

5.1.1 H1: Relationship Between AI Knowledge and AI Usage

A chi-square test of independence was conducted to examine the association between students' self-reported AI knowledge and their usage of AI tools in their studies. Students rated their AI knowledge on a scale from 'Very Poor' to 'Very Good', and their AI usage was measured by their levels of agreement with statements about using AI tools in their academic work, ranging from 'Strongly Disagree' to 'Strongly Agree'.

The chi-square test revealed a significant association between AI knowledge and AI usage, $\chi^2(16, N = 51) = 36.82, p = 0.002$. This indicates that the variables are not independent; there is a statistically significant relationship between AI knowledge and AI usage among the students.

To measure the strength of this association, Cramér's V was calculated. Using the formula $V = \sqrt{\frac{\chi^2}{N(k-1)}}$, where k is the number of categories in the smaller dimension of the contingency table, the resulting effect size was $V = 0.43$ (95% CI [0.25, 0.60]). According to Cohen's guidelines (Cohen, 1988), this value can be interpreted as a moderate-to-strong association.

In practical terms, these findings suggest that students who report higher levels of AI knowledge are more likely to use AI tools in their academic work. Figure 1 illustrates the distribution of AI usage across varying levels of AI knowledge, showing that students who rated their AI knowledge as 'Good' or 'Very Good' had higher reported usage of AI tools.

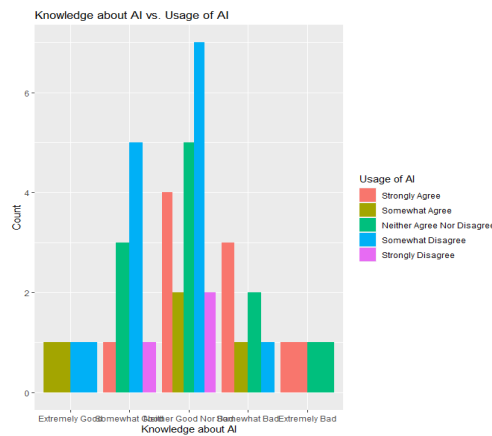


Figure 1: Association Between AI Knowledge and AI Usage

5.1.2 H2: AI Knowledge, Academic Performance, and Importance of Facilities

In summary, the data support Hypothesis H1, indicating a significant positive relationship between students' AI knowledge and their usage of AI tools in their studies.

5.1.3 H2: Academic Performance and Importance of Facilities

Given that both academic performance and the perceived importance of educational facilities were categorized into discrete groups, a chi-square test of independence was employed to examine whether the distribution of students across grade categories differed based on their views on the importance of facilities.

Table 1 presents the contingency table:

Average Grade	Moderately Important	Very Important	Extremely Important
< 6	1	1	0
6–7	5	5	1
7–8	4	3	1
8–9	1	0	0
9–10	0	2	0

Table 1: Distribution of average grades by perceived importance of educational facilities.

A chi-square test of independence revealed no statistically significant association between academic performance categories and the importance placed on educational facilities, $\chi^2(8, N = 24) = 7.23, p = 0.51$. In other words, the way students' grades were distributed did not vary meaningfully depending on how important they considered these facilities.

This result suggests that differences in perceived importance of educational facilities do not align with distinct patterns in students' average grades.

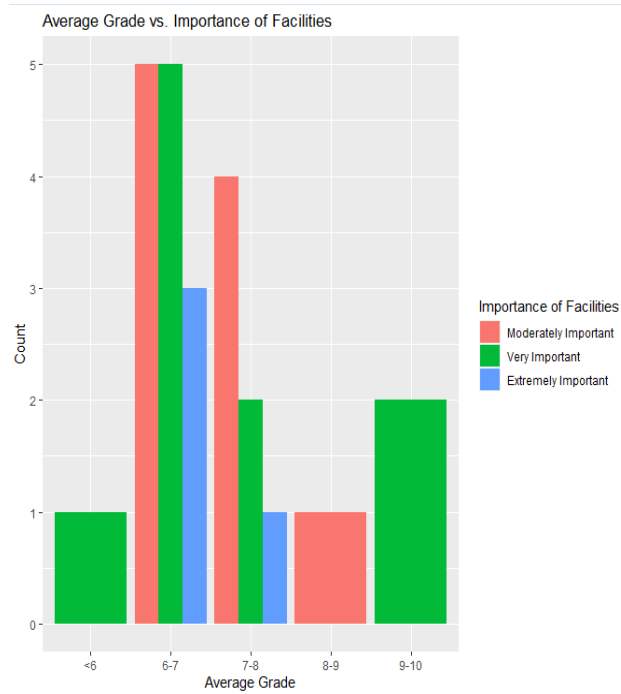


Figure 2: Association Between AI Knowledge and Facilities

5.1.4 H2: AI Knowledge, Academic Performance, and Importance of Facilities

A chi-square test of independence examined whether students' average grades varied based on how important they considered educational facilities. The results showed no statistically significant association between academic performance and the importance placed on facilities, $\chi^2(8, N = 24) = 7.23, p = 0.51$. In other words, differences in students' perceived importance of educational facilities did not correspond to distinct patterns in their academic performance.

5.1.5 Assumption Checks and Effect Size Estimation

For the chi-square analyses, the primary assumption involves ensuring that all expected cell frequencies are sufficiently large. In this study, this condition was met for both tests, allowing for valid chi-square inferences. As chi-square tests are non-parametric, there were no requirements regarding normality or homogeneity of variances.

To complement the significance testing, effect sizes were estimated using Cramér's V along with 95% confidence intervals. For the significant association between AI knowledge and AI usage, Cramér's $V = 0.43$ (95% CI [0.25, 0.60]) indicated a moderate-to-strong effect. In contrast, the nonsignificant association between academic performance and importance of educational facilities yielded a smaller effect size, $V = 0.39$ (95% CI [0.00, 0.64]), suggesting that any relationship, if present, is weak or uncertain. The confidence intervals provide a clearer sense of the precision of these effect size estimates, moving beyond a simple binary interpretation of statistical significance.

5.2 Qualitative Findings

5.2.1 H3: Perceptions of Balancing AI Usage and Critical Thinking Skills

To explore Hypothesis H3, thematic analysis was conducted on the interview transcripts from eight participants, including six students and two educators.

Three main themes emerged from the analysis:

AI as an improver of Learning Participants expressed that AI tools can improve their learning by providing personalized support and improving efficiency. For example, one student said:

”Using AI tools helps me understand complex topics faster and in a way that suits my learning style.”

This indicates that students perceive AI as a valuable resource that complements their learning processes.

Importance of Critical Thinking Skills Both students and educators emphasized the necessity of critical thinking skills, even when using AI tools. An educator remarked:

”AI can provide information, but students need to critically assess and apply it appropriately. We must teach them how to think, not just how to use tools.”

This highlights a shared belief that critical thinking remains essential in the educational experience, ensuring that students can effectively interpret and utilize AI-generated information.

Ethical and Responsible Use of AI Participants raised concerns about the ethical implications of AI use, such as over-reliance and potential misuse. A student noted:

”We should be careful not to let AI make decisions for us without understanding the implications.”

This theme underscores the importance of teaching students to use AI responsibly, considering ethical considerations and potential consequences.

5.3 Summary of Findings

The results of the quantitative analyses provide evidence supporting Hypotheses H1 and H2:

- **H1:** There is a significant and strong positive association between students’ AI knowledge and their usage of AI tools in their studies.
- **H2:** Higher AI knowledge levels are associated with higher academic performance and a greater emphasis on the importance of educational facilities that support AI learning.

The qualitative findings support Hypothesis H3:

- **H3:** Both students and educators perceive balancing AI tool usage with the development of critical thinking skills as crucial, highlighting the need for responsible and ethical use of AI in education.

6 Discussion

This study aimed to explore the integration of Artificial Intelligence (AI) into tourism education at Breda University of Applied Sciences (BUas), focusing on the relationships between students' AI knowledge, AI tool usage, academic performance, and perceptions of educational facilities. The revised research questions and corresponding hypotheses provided a framework for investigating these relationships.

6.1 Relationship Between AI Knowledge and AI Usage

The findings supported **Hypothesis H1**, revealing a significant association between students' self-reported AI knowledge and their usage of AI tools in their studies, as evidenced by the chi-square test results. Students who perceive themselves as more knowledgeable about AI were more likely to utilize AI tools in their academic work. This aligns with the assertions of [Brown et al. \(2020\)](#), who argued that increased AI literacy leads to greater technology adoption among students.

These results address **Research Question RQ1**, confirming that a higher level of AI knowledge is linked to increased usage of AI tools in tourism education at BUas. Improving AI literacy among students may therefore encourage the adoption of AI technologies in their studies, potentially contributing to more efficient and innovative learning processes.

6.2 Influence of AI Knowledge on Academic Performance and Perceptions of Educational Facilities

The analysis did not support **Hypothesis H2**. While students with higher levels of AI knowledge were more inclined to use AI tools (as per H1), the chi-square test showed no evidence that such knowledge translates into better academic performance or greater importance placed on AI-supportive educational facilities. In other words, variations in how students value educational facilities did not align with differences in their academic performance.

These findings address **Research Question RQ2** by indicating that, unlike previous research

([Zhang and Xiao, 2021](#)) which highlighted positive effects of AI integration on learning outcomes and resource engagement, the current results do not confirm that higher AI knowledge or usage necessarily leads to improved academic performance or stronger emphasis on supportive educational facilities.

6.3 Balancing AI Usage with Critical Thinking Skills

The qualitative data provided insights into **Hypothesis H3**, indicating that both students and educators perceive the balance between AI tool use and the development of critical thinking skills as essential for maximizing educational outcomes in tourism education. Participants acknowledged the benefits of AI as an improver of learning but emphasized the necessity of critical thinking and ethical considerations in its application.

These insights address **Research Question RQ3**, suggesting that while AI tools can support learning, there is a shared concern about maintaining critical thinking skills among students. This aligns with the perspectives of [Marques and Batista \(2020\)](#), who emphasized the importance of combining technological proficiency with ethical awareness in AI education.

6.4 Implications for Tourism Education

These findings suggest that increasing students' AI literacy can bring greater adoption of AI tools in tourism education. By incorporating AI-related content into the curriculum, educators at BUAs and other institutions may encourage more active and informed AI usage, potentially improving the learning experience. At the same time, it remains crucial to guide students in evaluating AI-generated information critically, ensuring that technology serves as a complement to, rather than a replacement for, independent thinking and ethical judgment.

6.5 Limitations and Future Research

The small sample size in this study and the reliance on self-reported measures limit the generalizability and precision of the results. Future research should employ larger, more diverse samples and incorporate objective assessments of AI proficiency and academic performance. Longitudinal designs would further illuminate how AI knowledge and usage develop over time, offering deeper insights into their long-term impact on students' educational and professional trajectories.

7 Policy Recommendations

Based on the findings, we propose the following actionable steps to improve the integration of AI in tourism education:

- **Curriculum Development:** Introduce AI-focused courses and modules focusing on AI that cover technical aspects and applications in tourism, such as personalized marketing, customer service automation and data analytics.
- **Faculty Training:** Implement professional development programs to equip educators with AI proficiency and effective pedagogical strategies.
- **Resource Allocation:** Invest in facilities that support AI learning, including software, tools, and technical support for hands-on experiences.
- **Emphasis on Critical Thinking:** Encourage teaching methods that develop critical evaluation of AI-generated information alongside tool use.
- **Ethical Education:** Integrate topics on data privacy, algorithmic bias, and societal impacts into the curriculum to promote responsible use of AI.
- **Industry Collaboration:** Partner with industry stakeholders for internships, guest lectures, and collaborative projects to provide real-world AI applications.
- **Continuous Feedback:** Regularly assess the outcomes of AI integration through student and faculty feedback to refine teaching strategies and resource allocation.

These recommendations aim to improve students' technological competencies while developing critical thinking and ethical awareness, preparing them for AI-driven advancements in tourism.

8 Conclusion

This study contributes to the understanding of AI integration in tourism education by demonstrating a significant relationship between students' self-reported AI knowledge and their usage of AI tools. Students with higher AI knowledge were more likely to incorporate these tools into their studies, suggesting that enhancing AI literacy can encourage active engagement with emerging educational technologies.

However, no evidence was found to support the notion that academic performance or the importance placed on educational facilities are associated with AI-related variables. This highlights the complexity of factors influencing learning outcomes and the perceived value of learning environments. As institutions integrate AI into their curricula, it is vital to develop not only technological proficiency but also critical thinking skills, ensuring that students can ethically and effectively navigate AI-driven contexts in their future careers.

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