

ARTIFICIAL INTELLIGENCE-ENABLED VIRTUAL SIMULATION: ITS ROLE IN TOURISM EDUCATION

Hembafan Pius Ogoina

*Department of Tourism and Hospitality Management
Federal University Otuoke, Nigeria
bafanogoina@gmail.com*

&

Chris A. Diminyi

*Department of Tourism and Hospitality Management
Federal University Otuoke, Nigeria
diminyica@fuotuoche.edu.ng*



Abstract

Artificial Intelligence is essentially transforming global industries, with the educational sector experiencing significant modification. Due to the integration of Artificial Intelligence (AI) across diverse disciplines, institutions are modernising curricula to foster more personalised, structured, and interactive learning environments. This research employs a narrative synthesis of selected literature concerning the application of artificial intelligence-enabled simulations in education. The objective of the study is to investigate the potential relevance of these applications in tourism education. Findings indicate that artificial intelligence (AI) facilitates the replication and exploration of virtual representations of real-world scenarios, processes, and systems. These technologies provide fast, consistent, and individualised feedback at a level beyond human ability. The integration of AI simulations into educational frameworks presents transformative potential for restructuring curricula and educational approaches. Such applications effectively accommodate large number of students while establishing safe, personalised, and cost-efficient training environments. The study also identifies the multifaceted benefits of integrating artificial intelligence (AI) into the tourism industry and its educational frameworks. In summary, it is recommended that further research be undertaken to maximize the benefits of integrating AI and digitalization in tourism education especially, on the design principles that will enhance the educational advantages of immersive simulations considering such factors like cognitive load, sensory engagement, and narrative structure.

Keywords: Artificial intelligence, virtual simulation, education technology, experiential learning, personalised learning

Introduction

The rapid advancement of digital technologies has significantly transformed the global educational landscape, shifting traditional teaching and learning paradigms toward more innovative, technology-driven approaches. Among these emerging technologies, Artificial Intelligence (AI) and virtual simulation have attracted considerable attention due to their potential to revolutionise educational practices and outcomes. Artificial Intelligence refers to the capability of machines to mimic human intelligence processes such as learning, reasoning, and problem-solving, while

virtual simulation involves the creation of computer-generated environments that replicate real-world scenarios for training and educational purposes (Holmes et al., 2019).

In recent years, the demand for more effective and engaging learning methods has increased, driven by the limitations of conventional classroom-based instruction. Traditional teaching methods often emphasise theoretical knowledge with limited opportunities for practical application, thereby restricting students' ability to develop critical thinking and problem-solving skills. AI-enabled virtual simulation has been proven to provide learners with experiential learning environments where they can actively participate in simulated real-life situations. According to Radianti et al. (2020), virtual simulation technologies have proven particularly effective in higher education by enabling students to practice complex tasks in a controlled and risk-free setting. The integration of AI into virtual simulation enhances its effectiveness by introducing intelligent features such as personalisation, real-time feedback, and adaptive learning pathways. AI systems can analyse large volumes of learner data to identify individual strengths and weaknesses, thereby tailoring instructional content to meet each student's unique needs (Chen et al., 2020). This personalised approach to learning is essential for addressing students' diverse learning styles and paces, ultimately leading to improved academic performance. Luckin et al. (2016) argue that AI has the potential to support both learners and educators by automating routine tasks, providing insights into learning behaviours, and facilitating more informed decision-making in educational contexts.

AI-enabled virtual simulation provides a safe and controlled environment for learning. This is particularly important in disciplines that involve high-risk or complex procedures, such as medicine, engineering, and aviation. Through simulation, students can practice skills repeatedly without the fear of causing harm or incurring high costs. For instance, medical students can perform virtual surgeries, while engineering students can test system designs in simulated environments. Such applications not only enhance competence but also build learners' confidence (Radianti et al., 2020). AI-enabled virtual simulation plays a vital role in promoting accessibility and inclusivity in education. With the increasing adoption of digital learning platforms, students can access educational resources from anywhere in the world, thereby overcoming geographical and physical barriers. This is particularly relevant in developing countries, where access to quality education and learning facilities may be limited. Zawacki-Richter et al. (2019) note that AI-driven educational technologies can help bridge the digital divide by providing scalable and flexible learning solutions. As a result, learners from diverse backgrounds can benefit from high-quality educational experiences regardless of their location.

Given the increasing significance of digital transformation in education, it is essential to investigate the role of AI-enabled virtual simulations in enhancing teaching and learning. Accordingly, this paper examines how the integration of AI and virtual simulation contributes to experiential learning, personalisation, engagement, and overall educational effectiveness. Through an analysis of existing literature and theoretical perspectives, the study provides a comprehensive understanding of the potential and limitations of AI-driven simulation technologies in education.

Literature review

AI simulation

AI simulation refers to the integration of artificial intelligence techniques with simulation technologies to create dynamic, interactive, and adaptive virtual environments. These systems are designed to replicate real-world scenarios, allowing users to engage in experiential learning through simulated experiences. AI simulation operates through a combination of machine learning algorithms, data processing systems, and virtual environment modelling.

At its core, AI simulation works by collecting and analysing user input data, which is then processed using intelligent algorithms to generate appropriate responses or actions within the simulated environment. For instance, in a virtual learning environment, AI systems can track learners' behaviours, assess their performance, and dynamically adjust the simulation to suit their learning needs (Radianti et al., 2020). This adaptability distinguishes AI simulations from traditional static simulations, making them more effective in promoting active learning. The underlying technologies include natural language processing, computer vision, and predictive analytics, which enable the system to interpret user interactions and provide real-time feedback. According to Makransky and Petersen (2019), immersive simulations enhanced by AI significantly improve learning outcomes by increasing engagement and cognitive immersion.

Artificial intelligence in education

Artificial Intelligence refers to the development of computer systems capable of performing tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. In education, AI is used to develop intelligent tutoring systems, automated grading systems, and adaptive learning platforms (Holmes et al., 2019). One of the most widely studied applications is intelligent tutoring systems (ITS), which provide personalised instruction based on learners' needs. Research shows that ITS leverage AI techniques such as Bayesian knowledge tracing and machine learning algorithms to adapt content and provide real-time feedback, thereby improving student performance and engagement (Liu et al., 2025).

Another important application is learning analytics, where AI systems analyse large datasets to monitor student progress and predict academic outcomes. Trujillo et al. (2024) found that machine learning models, such as Random Forests, Support Vector Machines, and neural networks, are widely used to enhance decision-making in areas such as career prediction and academic advising. Additionally, automated assessment systems have gained prominence, enabling assignment grading and instant feedback. Studies indicate that such systems reduce teachers' workload while improving assessment efficiency and consistency (Adil, 2025). Recent advancements have also led to the rise of generative AI tools, including conversational agents and content generation systems. A systematic review by Elnaffar et al. (2025) highlights that generative AI is increasingly used in programming education to provide personalised support, enhance motivation, and improve learning outcomes, although concerns about overreliance and academic integrity persist.

The capability of AI Simulation in Tourism Education

The tourism industry is inherently practice-oriented, requiring both theoretical knowledge and Artificial Intelligence (AI)-enabled virtual simulation has emerged as a transformative tool that bridges this gap, offering immersive, interactive, and adaptive learning environments that replicate real-world tourism contexts (Radianti et al., 2020; Chen et al., 2020). In heritage tourism education, AI simulation enables learners to virtually explore historical sites, cultural landmarks, and heritage destinations without leaving the classroom. Virtual environments can reconstruct historical events, architectural structures, and cultural narratives, allowing students to engage with cultural heritage interactively (Guttentag, 2010). For instance, AI-powered simulations can adapt to user decisions, providing personalised learning experiences that enhance cultural awareness and historical understanding.

Culinary tourism education benefits significantly from AI simulation, as it allows students to practice food preparation, presentation, and service delivery in virtual kitchens and restaurants. AI-driven simulations can replicate customer interactions, menu planning, and kitchen management scenarios, providing experiential learning in a risk-free environment (Makransky & Petersen, 2019). Such applications enhance not only technical culinary skills but also soft skills such as teamwork, customer service, and time management. Virtual simulations also enable students to experiment with diverse culinary traditions from around the world, promoting cross-cultural learning.

Tour guide education relies heavily on communication, storytelling, and situational problem-solving. AI simulations can recreate realistic tourist scenarios, allowing learners to practice guiding groups, responding to inquiries, and managing challenging situations (Chen et al., 2020). These systems can incorporate adaptive feedback, where AI evaluates the learner's responses, presentation style, and engagement strategies, providing immediate suggestions for improvement. Research suggests that simulated tour guiding enhances learners' confidence and readiness for real-world employment (Dwivedi et al., 2023).

Sustainability is a critical component of modern tourism education. AI-enabled simulation provides a platform for modelling environmental, social, and economic impacts of tourism activities, enabling learners to understand complex sustainability challenges (Buhalis & Law, 2008). For example, students can simulate tourism development scenarios that balance economic growth with environmental conservation. By manipulating variables such as visitor numbers, waste management strategies, and energy consumption, learners can assess the long-term consequences of tourism practices, fostering sustainable decision-making skills.

Museums represent key sites for experiential tourism education, but access can be limited by geographic, financial, or logistical constraints. AI simulations can create virtual museum tours where students interact with digital exhibits, historical artefacts, and multimedia presentations. These virtual experiences enhance student engagement and knowledge retention by providing a multi-sensory approach to learning (Radianti et al., 2020). Furthermore, AI can track student

interactions, offering personalised feedback and highlighting areas for deeper exploration, thereby optimising the learning experience (Holmes et al., 2019).

Merits and demerits of AI simulation in tourism education

AI simulation offers numerous benefits in educational settings. Firstly, it enhances experiential learning by providing realistic, interactive environments where students can practice their skills. Secondly, it supports personalised learning, as AI systems can adapt content based on individual learner needs (Holmes et al., 2019). Thirdly, it improves student engagement through immersive and interactive experiences, leading to better knowledge retention (Makransky & Petersen, 2019). Furthermore, AI simulation provides a safe learning environment, particularly in high-risk disciplines, and reduces the cost of physical training resources. It also enables remote learning, making education more accessible and inclusive.

Despite its advantages, AI simulation has several limitations. One major challenge is the high implementation cost, which may limit its adoption in developing countries. Additionally, the digital divide poses a significant barrier, as not all learners have access to the required technology. There are also concerns about data privacy and ethical issues, particularly regarding the collection and use of student data (Zawacki-Richter et al., 2019). Moreover, excessive reliance on AI systems may reduce human interaction and negatively impact critical thinking skills. Another limitation is the lack of technical expertise among educators, which may hinder the effective integration of AI simulation into teaching practices.

Method

A qualitative, conceptual research approach was adopted, utilising secondary data from scholarly articles, journals, and reports. Relevant literature was reviewed to analyse the role and impact of AI-enabled virtual simulation in education.

Results

Role in Enhancing Experiential and Immersive Learning

One of the most extensively documented roles of AI-enabled virtual simulation in tourism education is its capacity to facilitate deep, experiential learning that transcends the limitations of the conventional classroom. VR technology has the potential to greatly enhance the quality and effectiveness of tourism education, enabling students to engage with realistic and authentic tourism experiences that would otherwise be difficult to succeed. This includes the opportunity to virtually explore different destinations, cultures, and attractions, which in turn enriches their comprehension of history, geography, and ecology (Wen et al., 2024). Artificial intelligence has become central to contemporary educational technologies, as systems now learn, reason, and support complex cognitive tasks through adaptive processing; its integration into higher education signals a shift from static digital tools to intelligent systems that interpret learner behaviour and adjust instructional input accordingly (Sheikh et al., 2023; Ghosh & Arunachalam, 2022). When AI is embedded within virtual environments, the learning experience transitions from passive

observation to interactive, situated practice. VR supports immersion, experiential interaction, and contextualised learning, yet its effectiveness increases markedly when environments adapt to individual learner needs (Harake & Rijjal, 2024; Sheikh et al., 2023).

The theoretical foundation for this role lies in Kolb's (1984) experiential learning theory, which posits that knowledge is constructed through concrete experience, reflective observation, abstract conceptualisation, and active experimentation. AI technologies such as intelligent tutoring systems and adaptive learning environments facilitate this constructivist approach by providing personalised, experiential learning opportunities that enhance learner engagement, motivation, and academic performance (Lin et al., 2023). Empirical confirmation of this role in tourism-specific settings is provided by Wen et al. (2024), who studied 82 college students using VR technology over six weeks and found that VR-based learning produced high levels of satisfaction and motivation and resulted in measurable improvements in learning performance.

Role in Adaptive and Personalized Learning

A second critical role of AI-enabled virtual simulation is its capacity to personalise the learning experience in ways that static or one-size-fits-all pedagogical models cannot. The principal application of AI in education is adaptive learning it employs computation techniques to derive relevant data from the large volume of data created by learners, including their performance, interactions, and learning style feedback, to recommend and make necessary changes; this makes learning flexible, allowing students to advance at their own rates, relying on their individual weaknesses (Kumar et al., 2024). Intelligent tutoring systems and adaptive learning platforms **personalise** content delivery by adjusting instructional materials based on learners' real-time performance, thereby enhancing cognitive engagement; these systems use machine learning to detect knowledge gaps and provide tailored feedback, fostering deeper comprehension and sustained intellectual involvement (Liu & Yushchik, 2024; Strielkowski et al., 2025).

Role in Practical Skills Development and Safe Scenario-Based Training

AI-enabled virtual simulation plays a particularly indispensable role in building the practical, industry-ready skills that tourism programmes are mandated to develop. Tour guiding education represents a unique subset of tourism education where students must develop not only theoretical knowledge but also practical competencies such as effective communication, cultural sensitivity, and real-time problem-solving; unlike other areas of tourism education, tour guiding requires learners to engage with dynamic and unpredictable scenarios, making experiential learning a critical component of their training (Kahveci & Sondaş, 2025). AI-powered simulations offer a safe, repeatable environment for developing these high-stakes competencies without the risks, costs, or logistical constraints of live fieldwork.

The incorporation of virtual reality and artificial intelligence significantly enhances the realism and accuracy of virtual experiments, making them more effective at simulating real-life scenarios. Virtual simulation broadens experiential learning, promoting adaptive teaching methodologies and skill development (Chen & Liu, 2024). In hospitality management specifically, VR-enhanced

three-phase training has been applied in the hotel sector to prepare future staff by immersing them in realistic operational scenarios prior to industry placement (Lucie et al., 2022). The implications of safe, repeatable simulation training extend to high-risk areas such as tourism safety; Duan (2024) documented the application of VR in vocational tourism management colleges specifically for first aid and emergency response training, where realistic simulation is critical but live practice carries prohibitive risk.

AI complements VR environments through the incorporation of virtual tutors, guides, and intelligent agents that can provide learners with information on their progression through various virtual environments, answer questions, provide hints for particularly challenging scenarios, or assist in completing difficult tasks — these virtual tutors are based on natural language processing and can modulate their responses based on the type of query the learner asks (Kumar et al., 2024). This role is particularly relevant to scenario-based training in service encounters, where the unpredictability of human interaction is one of the greatest pedagogical challenges.

Role in Formative Feedback and Assessment

AI-enabled virtual simulation also plays a transformative role in how feedback is delivered and assessment is conducted in tourism education. Despite the recognised importance of feedback in enhancing student learning, feedback practices in higher education have not achieved expected effects, with a primary issue being student disengagement exacerbated by large class sizes and limited curriculum time; the advent of generative AI may help overcome these contextual constraints (Bearman et al., 2024). In virtual simulation environments, AI systems can deliver immediate, contextualised, and personalised feedback at each decision point within a scenario, a capability that human instructors managing large tourism cohorts cannot replicate. AI-driven gamified learning environments and immersive experiences, ranging from entrepreneurship simulations to virtual field explorations, increase student engagement by promoting authentic, experiential learning and enabling AI tools to streamline access to educational resources, particularly in digital and hybrid learning environments. In a study directly relevant to hospitality and tourism contexts, AI-enhanced VR systems bridging theoretical and experiential learning increased student engagement by 34% compared to conventional practice methods (Koney et al., 2024).

Artificial intelligence tools have enabled instructors to personalise learning and provide students with more immediate feedback, though they also raise concerns about academic integrity and the propagation of biased or inaccurate information (Fauzi et al., 2023; Farazouli et al., 2024). The assessment dimension is further complicated by the emergence of AI-generated content, which challenges traditional evaluation paradigms and demands that tourism educators redesign assessment instruments to privilege competencies such as professional judgement, intercultural sensitivity, and situational problem-solving that AI simulation can develop but cannot easily fabricate.

Role in Curriculum Design and Stakeholder Engagement

Beyond direct learning, AI-enabled virtual simulation is increasingly recognised for reshaping curriculum design and strengthening the relationship between tourism education and industry. Higher education institutions continue to rely largely on traditional instructional methodologies that insufficiently integrate AI-based digital technologies into professional training, creating a structural gap between industry expectations and graduate preparedness; empirical research proposing a systematic pedagogical model for AI-integrated tourism education remains limited. AI-driven simulation platforms offer a mechanism for continuously updating curricula to reflect evolving industry scenarios, without the logistical burden of redesigning physical practicum arrangements.

Research highlights how Large Language Models (LLMs) facilitate curriculum design by simulating diverse stakeholder perspectives, including those of government representatives, university administrators, educators, students, internship coordinators, and industry professionals, thereby supporting multidimensional analytical frameworks for examining the integration of GenAI in curriculum design and stakeholder engagement. This role extends to collaborative curriculum development, where AI simulation environments can serve as a shared space in which educators and industry practitioners co-design learning scenarios grounded in real operational challenges. The role of AI simulation in talent management and workforce preparation has been examined through scenario planning methodologies. Thematic analysis of data collected from international hospitality management students, academics, and 30 industry experts including general managers, HR managers, and IT managers underscored the importance of balanced AI integration that enhances rather than replaces human roles, with ethical considerations, the human-centric essence of tourism and hospitality, and the need for ongoing education and skill development emerging as central themes. (Bulchand-Gidumal et al., 2024).

Role in Widening Access and Promoting Inclusivity

AI-enabled virtual simulation plays a distinctive role in democratising access to high-quality tourism education by dismantling geographic, financial, and physical barriers to experiential learning. Calls for personalised learning has increase interest in AI-enabled virtual reality as a tool that can adapt instruction and support diverse learner populations who may face geographic, economic, or accessibility barriers to traditional field-based education. For students in regions with limited proximity to major tourism destinations or with financial constraints that preclude international study travel, AI-enabled virtual environments provide equitable access to destination experiences and professional practice scenarios.

Advances in VR technology should prioritise the enhancement of user comfort, cost reduction, and improved accessibility; lighter and more ergonomic designs, as well as cost-efficient production methods, have the potential to increase the accessibility of VR for educational institutions, while improvements in content creation tools could empower educators to customise learning experiences to cater to various educational requirements (Liu et al., 2023). A low-cost alternative noted in the literature involves the application of VR on mobile devices, with systems such as

Samsung Gear VR and Google Cardboard reducing hardware costs to approximately \$400, compared to over \$3,000 for dedicated VR installations, a consideration of relevance to tourism education institutions in lower-resourced contexts.

Role in Supporting Technology Literacy and Industry Readiness

A final, and increasingly prominent, role of AI-enabled virtual simulation in tourism education is its function as a site of technology literacy development — preparing students not merely as end users of immersive tools, but as future tourism professionals who must navigate an AI-saturated industry. International organisations emphasise that digital skills and AI literacy are becoming core employability factors in tourism and service sectors; however, higher education institutions continue to rely largely on traditional instructional methodologies that insufficiently integrate AI-based digital technologies into professional training, creating a structural gap between industry expectations and graduate preparedness.

Students who believe that AI platforms may assist them in complex modules, enhance their creativity, or improve their academic performance are more likely to express positive behavioural intentions toward adopting AI tools in their educational activities; furthermore, when students perceive AI as accessible and intuitive, they tend to adopt it seamlessly in their daily academic activities (Anditama & Hidayanto, 2024). This finding suggests that immersive AI simulation environments, by normalising student interaction with sophisticated AI tools, may simultaneously build the technology confidence and digital fluency that the industry increasingly demands of graduates.

AI technologies encompassing machine learning and natural language processing are transforming the tourism and hospitality industry by enabling machines to perform tasks previously done by humans, facilitating travel planning and booking through recommendation systems based on the analysis of large data volumes (El Hajal & Yeoman, 2024). Tourism graduates who have been trained within AI-enabled simulation environments are thus better positioned to understand, evaluate, and manage the AI-driven tools they will encounter in professional practice.

Conclusion

This paper has examined the roles of AI-enabled virtual simulation in tourism education, with evidence consistently indicating that this technology offers genuine and wide-ranging pedagogical value. Across the six identified roles—enhancing experiential learning, enabling **personalised** instruction, supporting practical skills development, transforming feedback and assessment, reshaping curriculum design, widening access, and building technology literacy—AI-enabled virtual simulation demonstrates a consistent capacity to address longstanding gaps between conventional tourism education and industry requirements. The findings suggest that virtual simulation should not replace traditional modes of tourism education but strengthen them when integrated within a thoughtfully designed blended pedagogical model. However, the transformative potential of these technologies will remain **unrealised** without deliberate institutional investment in faculty development, equitable access to infrastructure, and robust ethical governance of AI-mediated learning environments. Tourism education is at a critical

junction; institutions that approach AI-enabled virtual simulation with strategic vision, pedagogical rigour, and a strong commitment to student outcomes will be best positioned to produce graduates capable of navigating and leading in an industry increasingly shaped by artificial intelligence. However, the goal should not be to replace human capabilities but to complement and enhance them. By integrating AI responsibly and ethically, society can harness its benefits while minimising its drawbacks. As AI continues to evolve, its successful application will depend on thoughtful implementation, continuous evaluation, and a commitment to ensuring that technological progress serves the broader interests of humanity. Therefore, as questions about the enduring retention of skills and knowledge acquired through immersive learning, the ideal equilibrium between virtual and real-world experiences in tourism education, and the scalability of these immersive learning initiatives continued to persist, there is need to further research on the design principles that will enhance the educational advantages of immersive simulations, considering elements like cognitive load, sensory engagement, and narrative structure.

References

- Adil, M. (2025). Automated assessment systems in education: Improving grading efficiency and feedback consistency. *Journal of Educational Technology Research and Practice*. 2(2), 57-71
- Bearman, M., Tai, J., Dawson, P., Boud, D. & Ajjawi, R. (2024). Generative artificial intelligence as an enabler of student feedback engagement: A framework. *Assessment & Evaluation in Higher Education*. 49(6), 893 – 905.
- Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the internet — The state of eTourism research. *Tourism Management*, 29(4), 609–623.
- Bulchand-Gidumal, J., William Secin, E., O'Connor, P., & Buhalis, D. (2024). Artificial intelligence's impact on hospitality and tourism marketing: Exploring key themes and addressing challenges. *Current Issues in Tourism*, 27(14), 2345–2362
- Anditama, M. R. & Hidayanto, A. N. (2024). Analysis of Factors Influencing the Adoption of Artificial Intelligence Assistants among Software Developers. *The Indonesian Journal of Computer Science*, 13(4), 4425 – 4454
- El Hajal, G. & Yeoman, I. (2024). AI and the future of talent management in tourism and hospitality. *Current Issues in Tourism*, December (2024), 1 - 18
- Chen, J., & Liu, D. (2024). Optimising learning outcomes: A comprehensive approach to virtual simulation experiment teaching in higher education. *International Journal of Human-Computer Interaction*, 41(4), 2114–2134.
- Chen, X., Zou, D., Xie, H., & Cheng, G. (2020). Twenty years of personalised language learning: Topic modelling and knowledge mapping. *Educational Technology & Society*, 23(1), 92–105.

- Duan, X. (2024). Application of VR technology in tourism management in higher vocational and technical colleges. *International Journal of Mathematics and Systems Science*, 7(3), 11 - 17
- Dwivedi, Y. K., Pandey, N., Currie, W., & Micu, A. (2023). Leveraging ChatGPT and other generative AI-based applications in the hospitality and tourism industry: Practices, challenges and research agenda. *International Journal of Contemporary Hospitality Management*, 36(1), 1–12.
- Elnaffar, S., Al-Emran, M., & Shaalan, K. (2025). Generative AI in programming education: A systematic review of applications, benefits, and challenges. *Computers & Education*, 224 (2025) 105172
- Farazouli, A., Cerratto-Pargman, T., Bolander-Laksov, K., & McGrath, C. (2024). Hello GPT! Goodbye, home examination? An explorative study of AI and the digitalisation of higher education assessment practices. *Assessment & Evaluation in Higher Education*, 49(3), 363–375.
- Fauzi, M. A., Tan, C. N. L., Daud, M., & Awalludin, M. M. N. (2023). Exploring the opportunities and challenges of ChatGPT in academic writing: A systematic review. *Journal of Applied Learning and Teaching*, 6(2), 1–12.
- Ghosh, A., & Arunachalam, R. (2022). Artificial intelligence in higher education: A systematic review of applications, challenges, and future directions. *International Journal of Educational Technology in Higher Education*, 19(1), 1–22.
- Guttentag, D. A. (2010). Virtual reality: Applications and implications for tourism. *Tourism Management*, 31(5), 637–651.
- Harake, E., & Rijjal, R. A. (2024). Virtual reality in higher education: A systematic literature review. *Education and Information Technologies*, 29(7), 23957–23979
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Boston: Centre for Curriculum Redesign.
- Kahveci, S., & Sondaş, M. (2025). The impact of using virtual reality applications on academic success and retention in tour guiding education. *Journal of Hospitality, Leisure, Sport & Tourism Education*.6(1), 6 – 13.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
- Koney, D., Amoateng, P., & Boateng, R. (2024). AI-enhanced virtual reality and student engagement in hospitality education. *Journal of Hospitality & Tourism Education*, 36(3), 201 – 204.
- Kumar, S., Sharma, D., & Rani, S. (2024). AI and VR integration in e-learning: Designing meaningful learning environments. *World Journal of Advanced Engineering Technology and Sciences*, 13(01), 783–791.

- Lin, C. J., Hwang, G. J., Fu, Q. K., & Chen, J. F. (2023). A flipped contextual game-based learning approach to enhancing EFL students' English business writing performance and reflective behaviours. *Educational Technology & Society*, 23(1), 120–133.
- Liu, R., & Yushchik, E. (2024). AI-driven personalised learning in higher education: Enhancing cognitive engagement through adaptive platforms. *Journal of Educational Technology*, 11(1), 2353464
- Liu, R., Zhang, Y., & Strielkowski, W. (2023). The use of virtual reality in human training: Trends and a research agenda. *Virtual Reality*, 11(2023), 1127380
- Liu, Z., Zhang, W., & Peng, J. (2025). Intelligent tutoring systems and student learning outcomes: A meta-analytic review. *Computers & Education*, 195, 104–119.
- Lucie, R., Petra, J., & Martin, H. (2022). Innovating in the tourism industry through VR and education in the hotel business. *International Journal of Smart Education and Urban Society*, 13(1), 1–12.
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
- Makransky, G., & Petersen, G. B. (2019). Investigating the process of learning with desktop virtual reality: A structural equation modelling approach. *Computers & Education*, 134, 15–30.
- Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, 147, 103778.
- Sheikh, H., Shi, W., & Guo, T. (2023). Artificial intelligence in higher education: A systematic review. *International Journal of Educational Technology in Higher Education*, 20(1), 1–20.
- Strielkowski, W., Grebennikova, V., Lisova, O., & Rybakova, A. (2025). Adaptive learning platforms and cognitive engagement in higher education. *Education and Information Technologies*, 30(2), 2431–2448
- Trujillo, J. A., Huertas, C. A., & Correa, M. (2024). Machine learning models for academic outcome prediction and career advising in higher education. *Education and Information Technologies*, 29(3), 3215–3241.
- Wen, J., He, M., Yin, J., & Liu, X. (2024). The perceived coolness of using VR technology in blended learning can improve learning motivation and satisfaction. *Frontiers in Education*, 15:1344992.
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education — Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 39.