

Real-World Challenges in Tourism Education: A Problem-Solving Framework Utilizing Experimental and Computational Methods

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ABSTRACT

Tourism education is undergoing drastic changes parallel to the change in tourism industry around the world towards digitalization, sustainability and cross-cultural integration. Nonetheless, although there are now many academic programmes worldwide, there are important discrepancies between confining pedagogy to the requirements of the job sector. This review describes the main challenges encountered by tourism education, as follows: mismatches between skills, lack of technology integration, lack of experiential learning organization, weaknesses in sustainability education, and failure to develop intercultural competence. The analysis goes beyond to the potential inherent in the methodologies of experimentation (specifically simulations, virtual reality and experiential fieldwork) and their combination with computational methodologies, such as AI-augmented analytics, digital twin architectures and data modelling, thus being a holistic problem-solving continuum that promises to enable better educational outcomes. The potential of AI-enabled learning systems and low-cost experiential modules as well as digital literacy, aimed at improving competency development and creating inclusive and scalable learning and training environments is highlighted in the current review. Curricula with a focus on sustainability and cross-cultural pedagogic models are also considered essential to the upcoming curricular reform. By incorporating experimental and computed methodologies into the scholarly method, tourism education education may more effectively prepare graduates to meet the dynamic and technologically evolving and culturally diverse demands of the tourist industry...

Keywords: Tourism education; experimental methods; computational learning; digital literacy; sustainability curriculum; cross-cultural competence

INTRODUCTION:

The global tourism industry has become one of the fastest growing industries in the world economy and has made a significant contribution to employment generation, socio-cultural exchange and development of nations (Iftikhar et al., 2024). Prior to recent disruptions around the globe and uncertainty, tourism contributed roughly ten percent to the world's GDP, and provided employment to millions of people across a range of service sectors, from the hospitality and aviation sectors to travel planning, cultural tourism and destination management. In the context of an increasingly digital and post-pandemic environment which prioritizes sustainability, the tourism sector is experiencing changes in unprecedented ways (Deri et al., 2023). Consequently, the expectations for the new professionals graduated have risen and there is a need for substantive reorientation of the requisite competencies, the knowledge base on which it is based, and the technological proficiencies required for success within the industry. Employment sectors are imposing a growing demand for graduates that not only have a solid knowledge base, but can also demonstrate an ability to operate within rapidly changing environments using digital technologies, innovate, and solve complex problems and provide quality services with attention to cultural differences (Lin et al., 2022). Accordingly, the field of tourism education is experiencing an increasing

pressure to realign with industry requisites by incorporating more rigorous, responsive, and future-oriented teaching and learning pedagogy frameworks.

Notwithstanding the considerable attention paid to the design the tourist curricula and pedagogical frameworks, there is a noticeable gap between the competencies developed in academic life and the specific expectations of the tourism industry. In the past, conventional tourism education has mainly focused on the theoretical education, rote memorization and textbook learning (Ruhanen et al., 2020). While these methodologies provide some basic knowledge, often they do not prepare students with the necessary competencies for dealing with the complex realities of modern tourism operations. It is common for practitioners in the industry to blame graduates for not having soft skills, good problem solving, having poor communication skills across cultures, lacking technological literacy and being less flexible to quickly changing situations ranging from crisis management and unpredictable changes in tourist behavior to sustainability issues (Ara et al., 2024). Although significant focus has been on designing curriculum and pedagogic frameworks, there remains a perceivable gap between the competencies developed through the academic constitution of the students and the real demands of the tourism sector. Historically, tourism education has been largely focused on the theoretical approach, rote memorization methods and textbook-based modes of education (Ruhanen et al.,

2020). While these methodologies tend to give liberal knowledge, often they do not adequately prepare the students for the practical complexities involved in the working of contemporary tourism. Industry practitioners often cite the lack of soft skills, issue resolution, cross-cultural communicative abilities, technological literacy, and adaptability to fast-changing situations as the reason for the inadequacy of graduates (Ara et al., 2024), including crisis management and uncertain and unpredictable changes in tourist behavior and other issues such as sustainability.

In this scenario, innovative pedagogy frameworks are irreplaceable to improve the quality, responsiveness and relevance of tourism education. Contemporary tourism curriculum development has come to recognise increasingly the need for active-learning approaches, competency models and the experiential represent a leap between theory and practice. Pedagogical innovations, such as experiential learning, problem-based learning (PBL), design thinking and simulation-based education - which foster deeper understanding and enable skills-development in a realistic context (Caruana et al., 2015). These approaches strengthen the differential abilities of learners to meet real world challenges, use critical reasoning, collaborate effectively and develop pragmatic and progressive solutions. Moreover tourism by its very nature is an experiential area of academic study; a significant part of its expertise for being able to meet the requirements of navigating across the industry comes from true scenarios, service interactions, cultural dynamics and operational problem-solving (Quaye et al., 2025). Consequently, strictly following traditional didactic methodologies of instruction impedes the ability of learners to fully grasp the complex ambiguities and intricacies, which are inherent to tourism-related occupations. The incorporation of innovative pedagogical frameworks enables educators to recreate authentic habitats, allowing learners to engage in the process of acquiring knowledge through systematic experimentation, verification, and exploration, as well as reflective analysis (Azanza et al., 2022).

In this regard, methods and computational tools have become key instruments in the transformation process that emerged in relation to tourism education to meet the current challenges of the discipline. Experimental approaches that involve simulations, virtual reality (VR), augmented reality (AR), immersive field experiments and experiential workshops enable direct student interaction with the processes and decision-making that are embedded in tourism systems (Schaffer, 2017). By simulating a real-life context, these approaches help students practice customer interactions, crisis response, tour planning, and delivery of services in a controlled but also realistically possible scenarios (McGrath et al., 2021). Virtual - reality-based destination simulations can offer immersive experiences for students to gain a better understanding of spatial planning, visitor management and cultural interpretation, without the logistical challenges that come along with on-site field trips (Hawkinson, 2024). Furthermore, empirical studies from tourist behavior and quality of service provide empirical

data that can later be used by the scholars to solve practical problem-solving situations.

The experiential methodologies are complemented by computational methodologies i.e. artificial intelligence (AI), machine learning (ML), big-data analytics, modelling and simulation and digital twins, which offer powerful frameworks for the analysis of complex tourism systems and enable the improvement of decision making capacities (Rahmadian et al., 2023). Computational tools are giving learners the ability to study tourist flow patterns, predict demand fluctuations, examine sustainability metrics, assess revenue management methods, and run hypothetical scenarios using data driven methodologies (Vrasida & Vlaseros, 2025). The growing availability of data sets related to tourism, arising from various social media and booking platforms as well as environment-round environment records- and destination management organisations, creates an institutional learning environment where students can develop their data literacy and analytical skills that are key for the contemporary tourism industry (Wang, 2024). The interconnection of digital twins and simulation models allows for testing of analytical experiments of planning the destination, managing crowds, responding to crises, optimizing resources, in virtual ones.

The debut of computation tools not only adds to the technical competences grounded on students, but also prepares them to participate constructively with digital technologies that presently form the backbone of tourism management and policy-making processes (Cinar, 2020).

Given the speed of change in the tourism critically and the educational requirements, this review attempts to reflect the holistic synthesis of the real problems of tourism education and the adventitious possibilities of implementation of experimental and computational methodologies as a mechanism to solve problems (Aydin and Sirkeci, 2024). The review describes the changing competencies that are required by the tourism industry, examines the mismatch between the academic qualification and industry expectations, and evaluates the success of the re-invented pedagogical frameworks (Deri et al., 2023). The present investigation further explores the utilitarian potential of the experimentation modality, namely, Virtual Reality (VR), Augmented Reality (AR), and interactive simulations in conjunction with computational methodologies, namely, Artificial Intelligence (AI) driven analysis, big data application, and advanced modeling techniques with the objective of enhancing the teaching-learning continuum. Within this integrated framework the article proposes reducing conceptual and pragmatic disjunctions that currently affect the efficiency of tourism education (Mandalia, 2023).

The scope of this review is set up by first setting out as the dominant global trends and interdisciplinary perspectives, as well as empirical conclusions and findings that are drawn from current scholarship regarding innovations in tourism education. Moreover, the article outlines a problem-solving framework that combines experimental and computational methods, thereby providing educators, researchers and policy makers with a systematic method

for reforming tourism curricula according to the modern challenges. By incorporating information and understanding collectively gained from pedagogy, technological improvements, and by incorporating information about sectoral needs and demands, the current literature review aims to promote the sustainable relevance and competitiveness of educational offerings in the tourism sector. In doing so the overriding goal is in the development of a new generation of tourism professionals who are adaptive, technologically up to date and equipped to tackle the multifaceted and dynamic challenges that face the tourism industry in the twenty first century.

2. Real-World Challenges in Tourism Education

Tourism education now seems to be at a crucial intersection because the international tourist industry is undergoing a fast pace of escalation driven by technological innovation, international integration, changing traveler demand patterns, and imperatives of sustainability. Despite the numerous tourism curricula being offered by tertiary academic institutions worldwide, there remains a permanent gap between what students know and what they need to know in order to be employable (Ara et al. 2024). In the context of modern tourism, which is increasingly a data-driven and technologically advanced industry, the traditional curriculum that is based on the basics of hospitality and theory-based learning of technical knowledge is far from able to catch up with the day-to-day needs of the industry.

The practical challenges faced by educators and the learners are manifestations of wider problems of structural misalignment between demanded competences and the skills of stakeholders, inadequate integration of technology, limitations of experiential learning, and issues concerned with sustainability and ethics (Sung et compañía,'altro ciudades 2024). Moreover, the process of globalisation produces an escalation of expectations about intercultural sensibility and communication. A deep knowledge of these challenges form a vital part of the foundation in building a problem-solving framework that trains graduates with a spectrum of competencies to provide the industry with its current demands whilst simultaneously preparing graduates for the shocks yet to come.

2.1. Skill Mismatch and Competency Gaps

The existence of skill mismatch is a critical issue in tourism education. Employers repeatedly state that graduates are frequently lacking in the competencies needed to successfully work in dynamic tourism operating environments. Although it is no secret that students are great at theoretical knowledge, it is a common issue that they find it difficult to implement what they have studied in practice (Quintela et al., 2024). The main reason for this problem is the lack of hands-on experience that is included as part of formal degree programs. Numerous institutions still provide very similar, if not identical, programs, which are based mainly on lecture-based teaching, case studies and generic internship placements that often do not match the specialized occupations required within the tourist industry itself (Ruhanen et al., 2020). Key competencies, such as crisis management, digital marketing, revenue optimisation, sustainability

assessment, and designing customer experience, are usually underrated or merely superficially covered in the scholarly literature (Quintela et al., 2024).

The difference is also worsened by the rapid development of the industry. Emerging technologies, changing consumer expectations and sustainability requirements require constant renewal of the curriculum however, educational programmes regularly work under long drawn-out multiyear approval processes which limit flexibility (Selamat et al., 2025). Industry stakeholders report that graduates often lack key soft skills (skills they consider essential in the tourism industry) such as adaptability, empathy, communication and resilience, which have been blamed on the inherently service-oriented nature of the industry.

Nonetheless in many fields educators are often faced with the challenge of finding faculty members with recent industrial experience, which further contributes to the growing gap between the pedagogical orientation of education and practical operational insight (Millar et al., 2008). Consequently, the skills mismatch is inexorably linked to structural limitations which require the development of new and innovative pedagogical frameworks and the creation of solid academic-industry linkages.

2.2. Insufficient Technological Integration

Technological competence has become a prerequisite for modern times tourism; however, tourism education is often far behind in giving proper training related to digital tools. Contemporary technologies such as virtual reality (VR), simulation platforms, digital twins, artificial intelligence (AI)-driven analytics as well as smart tourism applications are disrupting destination management practices and affecting how travellers make decisions (Deri et al., 2023). Nonetheless, a large percentage of tourism curricula still rely on outmoded instructional resources or do not give proper attention to technological innovation. The virtual reality (VR) simulation integration quantification, for example, hinders the learning ability of the immersion in the authentic destination context, the rehearsal of crisis management situations, or the understanding of the spatial dimension embedded into tourism planning (Schaffer, 2017).

Moreover, data literacy is becoming a basic requirement for professionals from the tourism sector. Hotels, airlines and other destinations are increasingly using big data analytics, machine learning and predictive modelling to understand market trends, personalize their services and optimize pricing strategies (Pande & Sengupta, 2024). Notwithstanding, a considerable proportion of students graduate without getting basic training in data collection, visualization or data interpretation using applications such as Excel-based analytics programs, visualization platforms such as Tableau, geographic information systems (GIS) or artificial intelligence (AI)-driven sentiment analysis platforms. Faculty members may also demonstrate a lack of technological skill or a lack of institutional support needed for the effective integration of these instruments into the program curriculum. This deficiency thus leaves us at a serious disadvantage especially considering how expeditiously the tourism

industry is embracing intelligent technologies, customer analytics, automated service systems and digital transformation strategies. In the absence of the strong technological underpinnings, graduates struggle to stay competitive in ever more digitally-oriented workplaces.

3.3. Challenges in Experiential Learning Models

Experiential learning forms a key component of tourism education; however, building strong experiential pedagogical foundations comes with an endless number of logistical, financial and regulatory issues. Field excursions, internship placements, active projects, and community-based tourism activities are principally resource-intensive activities that require in-depth institutional planning (Quaye et al., 2025). In many tourism programmes, especially in a developing world context, the limited availability of financial resources often inhibits ability of programmes to organise fieldwork or to provide field-work experiences which permit students to see the actual workings or operations of tourism activities. As a result the budgetary constraints limit the breadth and depth of practical learning opportunities provided to the participants.

Furthermore, a cross-border or interregional mobility is often required for implementing the concept of experiential learning in the tourism industry. This requirement presents a series of regulatory barriers, including the need to obtain visas, comply with different legal requirements, comply with different safety standards, and incur high logistic costs, all of which make such immersive educational efforts less feasible and desirable (Chen et al., 2022).

Safety considerations take on new importance against the backdrop of adventure tourism, outdoor recreation, and cultural tourism, more often seen as per se dangerous because of their experiential learning activities including physical and environmental risk. Institutional stakeholders must run within the complex structure of insurance and legal liability, at times, averting the ability to engage in meaningful fieldwork (Saggar et al., 2023). The elements of accessibility concern are a separate complicating element. Remote learners, working people and people with disabilities have often faced barriers that stop them from being active in on-site tourist activities, which require travel, physical mobility or a high level of time commitment (Costa et al. 2024).

The Covid-19 pandemic further revealed prior weaknesses of experiential learning; travel restrictions and/or institutional closure as a result of economic downturns, as well as the cancellation of field courses and internships significantly reduced the opportunities to receive in situ deliverables through learning. Although virtual field trips and solution-based alternatives have emerged, a large proportion of programs still lack scalable and well designed solutions that can replicate authentic real world experiences (Schott & Marshall, 2020). Tourism educators try to balance academic rigour with the sacrality in the implementation of pedagogical methods; hence, the use of experiential models will become simultaneously indispensable and hard to implement.

3.4. Sustainability and Ethical Training Challenges

Sustainability currently is a high-profile topic in tourism academia; however, the question of how to successfully infuse substantive sustainability education into tourism curriculums is a complex one. In its own nature, tourism encompasses environmental preservation, cultural preservation and socio-economic development (Ara et al., 2024). However, a significant number of programmes still approach sustainability as an embellishment and not as the encompassing framework in which all pedagogical objectives are informed. Students are often given a theoretical talk about concepts such as carrying capacity, environmental impact assessment or the sustainable development goals (SDGs) amongst others; however, the empirical aspects of conducting applied sustainability projects or engaging in serious form of ethical debates are often avoided (Price et al., 2024).

Moreover, the consequences and effects of tourism at the local level; from cultural assets commodification to displacement, call for a more profound ethical examination. In the lack of systematic teaching about ethical decision making, students may not be equipped with appropriate training to overcome complex dilemmas, such as between visitor satisfaction and the welfare of host communities, or dealing with the problems of overtourism and natural resource guardianship of fragile ecosystems (Lucia et al., 2021). This challenge is compounded by an increasing need on the part of employers and policy makers for graduates who are able to perform sustainability audits, design experiences with lower environmental impacts and calculate carbon footprints. A shortage of Inter-disciplinary approaches and inadequate course coordination with other related disciplines-Environmental science, Anthropology & development studies adds further limitation to the spectrum of sustainability education (Annelin and Bostrom 2024). As it is likely that global tourism evolves in line with climate ambitions and models of responsible travel, urgent curriculum reforms are therefore in order in this domain.

3.5. Globalization and Cultural Competence Challenges

Tourism feeds on the variety of culture, however, there is a significant number of tourism graduates who are lacking in cultural competence and have little intercultural and global awareness. As destinations are increasingly becoming globalized and multicultural, professionals are faced with the issue of navigating disparities of linguistic, normative, value and communication style (Liu et al., 2022). However, many academic programs are not set up to give their students structured opportunities to develop these competencies. While the integration of theoretical instruction into a cultural and heritage context is widespread, the delivery of practical instruction in multicultural team collaboration, cross-cultural negotiation or adherence to global service standards, is often inadequate. Learners will often face problems associated with intercultural communication barriers while participating in internship placements or international deployment situations. Proficiency in language is a further limitation shaping the opportunity in regions where the global tourist industries significantly rely on the use of English or multilingual communicative situations (Chen et al, 2023). Although the increasing

diversity of student demographics may bring some beneficial results, it presents at the same time pedagogical challenges for instructors who find themselves responsible for accommodating different learning modalities, cultural expectations and linguistic proficiencies.

Within the context of the globalised tourism, cultural competence is not only desirable but imperative. In the absence of the right training, graduates may face challenges in providing inclusive services, working effectively with international teams and adapting to culturally-complex destinations. The response to these challenges requires the inclusion of intercultural training modules, international exchange opportunities and global pedagogical methodologies in academic institutions.

4. Experimental Methods in Tourism Education

The diagram offers a conceptual framework for scientific tourism, which is delineated in distinct disciplinary spheres and activity modalities in three main domains - Exploration & Adventure, Scientific Research and Education and Learning - which Culture and Interpretation, a central dimension, is placed between them. The degree of scientific methodology used is represented across the horizontal axis, where the scale is marked from 0 percent upwards: At the same time, the vertical axis indicates the position of the participant, with participants in the lowest position being consumers, and the highest being inventors or front-line contributors.

In the intersection area of the conceptual circles, nine categories of scientific tourism are outlined depending on the main emphasis - adventure, education, culture, and scientific rigor - for such types of tourism. Activities such as Scientific Explorations (1) and Scientific Expeditions (6) are located closer to the scientific research domain thus emphasizing the careful use of scientific methodologies. Educational and Cultural Travel (2) and Sports and Culture Explorations (3) focus on didactics and cultural immersion and involve little connection to the scientific process. On the other hand, the various forms of hybrid modalities such as Scientific Ecovolunteering (4), Ecotourism with a Scientific Approach (5) and Educational & Scientific Ecovolunteering (8) involves the integration of educational objectives with the gathering of data in the field, and therefore choose the combination of scholarship and experiential in the sense of combining education and data collection. At the nexus Multi -foci Scientific Tourism (9) epitomize the activities amalgamate all four of these constituencies. In summation it is clear to see the expansiveness of the interdisciplinary reach of scientific tourism and the ease with which different roles of participants can be facilitated.

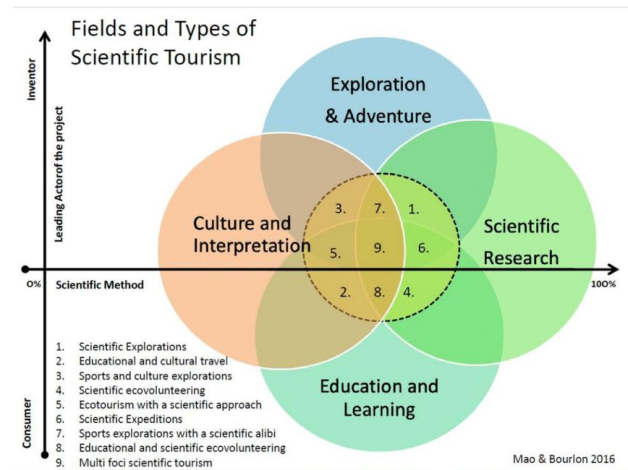


Figure 1. Fields and Types Of Scientific Tourism: A Conceptual Venn Diagram (Valette et al., 2021)

5. Computational Methods for Enhancing Tourism Education

Multilayer IoT-Fog-Cloud Based Intelligent Tourism Recommendation Systems

The architecture includes a unified architecture greatly living together of Internet of Things (IoT), fog, and cloud computing to support an intelligent tourism recommendation system. This architecture is stratified in three hierarchical computational levels: the Device Layer, the Fog Layer, and the Cloud Layer and each of these levels run different well defined functions in the overall data-processing pipeline.

At the foundation level, the Device Layer includes Internet-of-Things enabled endpoints including wearables, smart phones, smart cameras, laptops and GPS enabled devices. These technologies gather multidimensional information on a continuous basis regarding tourist activities: geolocation, user-byuser or human-environment interaction, the environmental conditions and activity preferences. Data acquisition is done before the journey and on the day on which the exploration in the tourist destinations occurs.

The Fog Layer that is positioned below Media Tier, is like a distributed computational interface where processes are made available to execute the local stage data preprocessing and analytics with low latency. Within this layer, raw data that is transmitted from IoT devices (yellow arrows) undergoes filtration, feature extraction and preliminary pattern recognition. The fog nodes thus eliminate the consumption of bandwidth and improve the response times, sending only the data streams defunct and refined to the cloud layer (blue arrows).

On the highest level, the Cloud Layer absorbs and manage large sets of information which include details about users and also information on tourists behaviours, environmental surveying systems and meteorological datasets. Sophisticated artificial intelligence and machine learning algorithms are at play at this layer to make recommendations on what tourist attraction you would like to explore based on your preferences. These outputs (indicated by purple arrows) are then sent to the end-user

devices for the facilitation of context-aware and adaptive tourism services.

The fusion of iconographic elements that denote eating, culture, leisure and nature shows the ability of the system to work on heterogeneous domains of tourism. Overall, the architecture presents a comprehensive and multilayered model for smart tourism, by leveraging Internet of Things sensing, fog level optimization and cloud based intelligence to provide real-time data-driven recommendations to visitors.

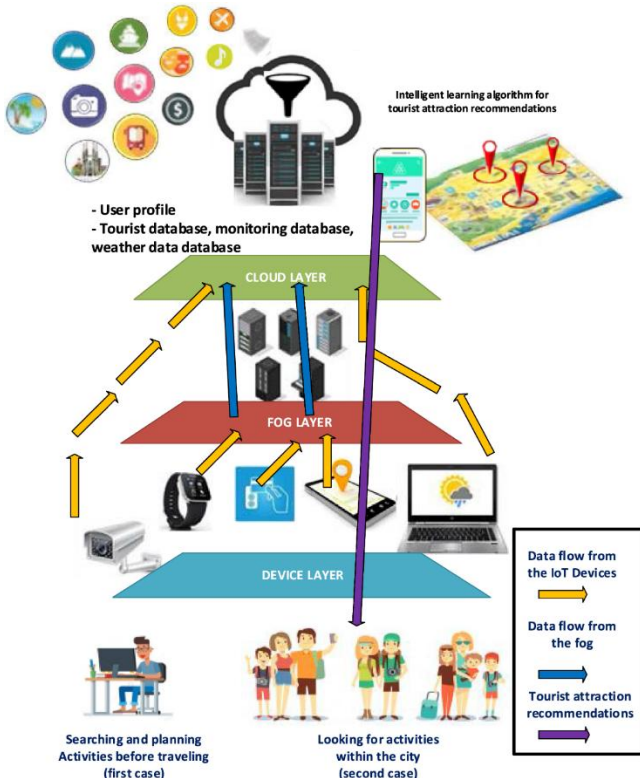


Figure 2. IoT-Fog-Cloud Architecture for Intelligent Tourism Recommendation Systems (Cepeda-Pacheco et al., 2022)

Structured Pedagogical Framework for Multidisciplinary Tourism Project Development

The figure outlines a structured pedagogical and project management framework designed to consider integration of multi-disciplinary learning and stakeholder engagement and evidence-based project formation in the intended field of Tourism education or tertiary or higher education in the field of territorial planning. The workflow starts with a Global Presentation stage whereby the general challenge, approach to the methods and the distribution of the tasks are formally introduced. Key institutional actors - such as public institutions, consulting firms and subject-specific modules (PM, TDM, TP) set the context for the problem and the expectations. This is then followed by an Implementation phase, which is supported by team building exercises aimed at facilitating the establishment of cohesive working groups that can work collaboratively through enquiry.

Thereafter, each of the curricular modules provides specific content in the domains of Project Management,

Tourism Destination Management, and Territorial Planning to the system, augmenting the theoretical and methodological foundations of the system. Concurrent sessions that focused on team development, conflict resolution and communication teach important soft skills reinforcement. Systematic group tutorials and coaching interventions ensure that there is continuity of mentoring and adherence to methodology standards.

The central part of the framework explains the data acquisition phase which integrates various types of heterogeneous sources for data acquisition such as mobile applications, social media platforms, web data, institutional records, field observations and interviews. These inputs are analytical development, contextual analysis, POI, SEO analysis and others. The resultant processed outputs are cumulated in the production of a First Draft that is then reviewed by institutional and consulting stakeholders to ensure that it is practical in relevancy and methodologically sound.

The final phase, on the other hand, called Evaluation, causes the iterating the feedback from public institutions and consultation experts, this in direct tutorials and coaching culminates in the production of a tackled, interdisciplinary Final Work. Overall, the figure represents a structured, multiple actor educational model, which is based on combining experiential learning, empirical data processing and professional mentorship for strengthening competence in tourism and the development of projects.

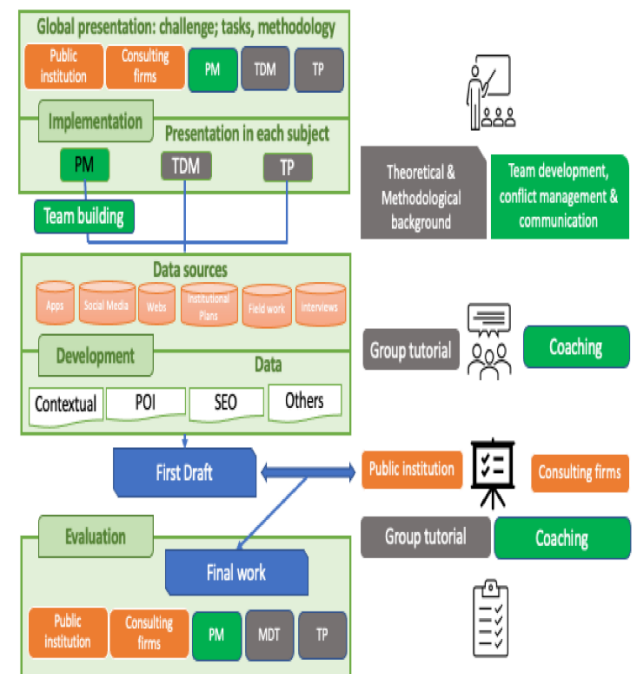


Figure 3. Project Workflow & Stakeholder Engagement Framework: Challenge Definition to Final Evaluation (Azanza et al, 2022)

8. Future Research Directions

With the constant progress of tourism education as a solution to the global issues and the advancement of technologies and change in industry, the need for research

with future perspective has been significantly increased (Deri et al., 2023). Prospective investigations not only have to redress existing lacunae but also proactively look for emerging trends that are likely to have an impact on tourism labour markets and educational framework in the coming decades. Central to this transformation will be interfacing synthetic artificial intelligence (AI), scalable experimental pedagogies, frameworks of digital literacy and curricular frameworks of sustainability paradigm (Budeanu et al., 2024). Accordingly, this section unambiguously points salient directions for further inquiry that points out conceptual, methodological and practical considerations that can be employed to redefine the tourism education landscape.

8.1. Enhancing AI-Driven Pedagogical Systems

Artificial intelligence is expected to possess an important underpinnings in educating tourism in the future, however, its pedagogical capability has not been comprehensively explored. Consequently, future scholarly inquiry has to center on elaboration of AI-enabled systems that are capable of moving beyond prone-to-error automation processes, in order to deliver substantive, tailored and context-specific learning experiences (North et al., 2023). For example, adaptive learning environments based on algorithms of machine learning can track the progress of students in real-time, identify knowledge gaps, and build personalized learning tracks and trajectories for students based on different competencies, cultural milieus and vocational aspiration (Strielkowski et al, 2024). Such configurations based on AI-search has the potential to revolutionize tourism training with curriculum outcomes that have been affiliated with sector specific competencies, in a spectrum ranging from hospitality management to crisis situation decision making, cultural interpretation, to experiential service delivery.

Another interesting and exciting direction of research is the application of artificial intelligence to the analyses of predictive analytics in the design of curricula. By viewing data acquired based on labor markets employee surveys, customer reviews, and International tourism trends, Artificial Intelligence algorithms can forecast the most needed skills that will be required for tourism industry professionals in the future (Weichselbraun et al., 2024). Researchers can look into how these predictions can be used to endorse the updating of the curriculum dynamically and thus maintain academic programs that can be responsive in a rapidly-evolving sector. AI chatbots and virtual assistants have also provided opportunities for the enhancement of student support services. These tools are able to simulate customer interactions and situations with complex situations, provide learners with step-by-step guidance, and provide immediate feedback that helps improve communication and problem-solving skills (Moore & Tsay, 2024).

Furthermore, studies should consider the ethical issues that pertain to the use of AI in educational settings. Concerns that involve data privacy, fairness of algorithms, possible prejudice of automatic judgment factors and the risk of technological dependency should go under strict critical analysis. (Hanshaw, 2024). The study of the nature

of culturally inclusive AI design is particularly relevant in the case of tourism education as the students come from a heterogeneous background and the tourism industry itself is very much based upon intercultural communication. Interdisciplinary work between educational technologists, computer scientists, cognitive psychologists and tourism scientists will be invaluable in the creation of AI systems that are not only technologically capable, but also whose pedagogy and social outcomes can be described as Vale (Teemu, 2023).

8.2. Low-Cost and Scalable Experimental Modules

While technologies like virtual reality, augmented reality, and simulation-based learning are making a revolutionary impact on training in tourism education, the expensive costs of its implementation limit widespread use in many institutions - especially in developing nations where tourism is playing an important role in the economy (Vaishnavi & Ajit, 2024). Future research work should focus on creating low cost, scalable and flexible modules of experimental work designed to democratise access to experiential learning.

Notably, mobile-based simulations made possible with the smart phones, already available to a large majority of students, provide a feasible way to recreate different contexts of tourism, such as hotel administration, travel organisation, heritage interpreting and crisis management. Scholars could explore the use of rudimentary but interesting interfaces that can mimic real-world decision-making contexts and which do not require expensive virtual reality devices or special devices (Minohara et al., 2025).

Another research focus single-mindedly features on modular experiential kits which are readily adapted into existing curriculums. Such kits may include problem solving games, table top simulations, digital story telling exercises, and role playing in the form of re-perforating the complexity inherent in the tourism operations (Chen et al., 2022). Comparative research into the effectiveness of different but high and low cost modules may reveal pedagogical designs to maximise the learning value per unit cost.

Research is also needed in the area of hybrid models because of the need to combine physical experimental configurations with digital tools. For example, real-product field experiments such as visitor tracking in the local tourist attractions, or customer satisfaction in the hospitality establishments can be enhanced through the use of low-cost digital data collection instruments and in so doing students will be able to carry out meaningful research while also developing analytical skills (Dredge & Gyimothy, 2017). The scalability of models of this kind, more so of large and geographically dispersed student populations, is a significant research gap.

In conclusion, scholars should measure the readiness of the faculty in line with pedagogical training that is wholesome for implementation of experimental modules. There is a considerable percentage of educators who are not technically competent enough to effectively integrate such tools. Empirical investigations to assess frameworks of professional development, strategies of Peer learning & mechanisms of institutional support can inform

sustainable uptake of innovative experiential methodologies.

8.3. Digital Literacy and Cross-Cultural Competency Research Gaps

Digital literacy has become an important requirement of tourism sector professionals, however there are still difficulties to implement comprehensive and of each industry's digital competencies in programmes as a considerable part of academic programmes. Consequently, empirical inquiry imperative to delineate the constituent elements of "tourism-specific digital literacy", particularly in an era that is characterised by the pervasiveness of data analytics, online consumer behaviour, social media marketing and digital guest experience management in being central operational elements within the management tourism entities (Sharma & Egger, 2025).

Future research should look at digital skill gaps between students and educators, delving into what factors such as geographical location, socio-economic background, language abilities and access to technology played in the digital competency of students as well as how. Comparative research of different countries as well as different groups of culture might make visible that are structural inequities to create a digitally competent tourism workforce (Zuniga-Collazos et al., 2025).

Cross-cultural competence is one of these fields where call for critical importance is called for immediate attention. The tourism business in nature involves the contacts between the individual with different cultural backgrounds. Nevertheless, dominant educational models are often unable to deal comprehensively with the complexity in intercultural communication cultural intelligence and inclusivity (Liu et al., 2022). Future research should test innovative pedagogical approaches to developing cross-cultural competencies, among them, but not only, virtual intercultural exchanges, artificial intelligence facilitated language learning, cross-border collaborative projects and digital ethnographic activities.

Moreover, digitalisation has given rise to new dimensions in cultural interaction as witnessed in the form of online hospitality platforms, virtual destinations and algorithmically mediated tourist experiences. Empirical enquiry should be a measure of the impact that digital spaces have on cross-cultural understanding and misunderstanding. The incorporation of digital literacy in intercultural training is a promising path, and it requires the development of an interdisciplinary approach which synthesises tourism studies, communication science, digital humanities and educational psychology (Jin, 2023).

8.4. Sustainability-Oriented Tourism Curricula

In the light of present-day problems with tourism, increasing issues such as climate change, over tourism, biodiversity degradation and socio-economic inequality have guaranteed that sustainability priorities have found a firm footing in tourism and industry-wide transformation. Nevertheless, there has been a delay in the development between the growing complexity and the growing urgency of sustainability issues and tourism education (Chen et al.,

2022). Accordingly, efforts in future research need to be targeted on the design of curriculums aimed at sustainability and that are able to provide learners with a full-fledged conceptual framework as well as practical methodologies for the implementation of sustainability tourism solutions.

The scholarly community is urged to consider effective approaches and pedagogical frameworks for the delivery of sustainability education, especially learning experiences that lie under problem-based learning approaches that address real environmental problems and/or sustainability simulations, learning embedded within the community, and service learning partnerships with stakeholders within the regional tourism industry (Ara et al. 2024). Comparative inquiries might shed light on the degree to which these modalities affect sustained conduct of student, decision trajectories of student and professional proficiencies.

Moreover, sustainability education needs to utilize interdisciplinary content, throughout environmental science to policy to economics to culture to technology. Empirical explorations should test best practices of interdisciplinary frameworks that can facilitate tourism students to the understanding of the inherently interconnected nature of the challenges of sustainability (Okumus et al., 2018). Application of computational methods or methods like carbon - footprint analysis, GIS modeling and predictive Sustainability analytics also deserve a close call as these are useful to understand and enhances the capacity of students to take data based decisions about sustainability.

Finally, future researches needs to address the need to bridge the implementation deficit which is responsible for the failure of the knowledge of sustainability to often translate to sustainable practices in the tourism industry. A systematic study of the barriers associated with institutional limitations, industry resistance, policy mismatch and attitude of students could lead to actionable information towards curriculum design to foster awareness and real-world impact on the ground.

Conclusion

Tourism education sits at a critical inflection point right now as international trends in the industry are demanding graduates with technological competency, cultural intelligence and the ability to address complex issues of sustainability. This review reveals that conventional pedagogical strategies - whilst of basic essence - continue to be deficient in bridging the everlasting chasm relating to scholarly training and the requirements relating to the practice of the profession. Innovative pedagogies with methodologies, such as the use of virtual simulations, immersive field experiences and problem-based learning, provide significant possibilities for the enhancement of applied competencies. Similarly, computational tools (including artificial intelligence assisted analytics, digital twin technology, and predictive modeling) provide opportunity differentiating levels for developing data literacy and informed decision making. With every increase of equality in education, the focus needs to be more on delivering accessible and scalable experiential modules and subsequently allowing equitable

participation in various learning environments. The incorporation of sustainability and ethical training in the curriculum of tourism courses is equally important as apart from this, it will enable the students to have interaction responsibly with environmental and socio-

cultural issues. By using interdisciplinary, data-driven and practice-focused educational models, tourism education can produce a workforce ready for the rapidly changing face of the global tourism industry.

REFERENCES

1. Ara, A. F.-V., Guereño-Omil, B., & Ageitos, N. (2024). Embedding Sustainability in Tourism Education: Bridging Curriculum Gaps for a Sustainable Future. *Sustainability*, 16(21), 9286. <https://doi.org/10.3390/su16219286>
2. Aydın, B., & Sirkeci, İ. (2024). Navigating the Frontier: Addressing Artificial Intelligence Challenges in Tourism and Hospitality Education. *Transnational Education Review*, 2(1), 49. <https://doi.org/10.33182/ter.v2i1.3249>
3. Azanza, G., Ara, A. F.-V., & Prat, A. G. (2022). Enhancing Learning in Tourism Education by Combining Learning by Doing and Team Coaching. *Education Sciences*, 12(8), 548. <https://doi.org/10.3390/educsci12080548>
4. Caruana, E., Roman, M., Hernández-Sánchez, J., & Solli, P. (2015). Longitudinal studies. *PubMed*, 7(11). <https://doi.org/10.3978/j.issn.2072-1439.2015.10.63>
5. Çınar, K. (2020). The Digital Revolution: Impact on Tourism Education. *Journal of Tourism and Gastronomy Studies*, 8(4), 2417. <https://doi.org/10.21325/jotags.2020.719>
6. Deri, M. N., Zaazie, P., & Singh, A. (2023). Digital Future of the Hospitality Industry and Hospitality Education Globally. In *Springer international handbooks of education* (p. 1). Springer Nature (Netherlands). https://doi.org/10.1007/978-981-99-3895-7_14-1
7. Hawkinson, E. (2024). Immersive Simulations in Tourism Education. <https://doi.org/10.18122/td.2347.boisestate>
8. Iftikhar, H., Ullah, A., & Pinglu, C. (2024). From regional integrated development toward sustainable future: evaluating the Belt and Road Initiative's spillover impact between tourism, Fintech and inclusive green growth. *Clean Technologies and Environmental Policy*. <https://doi.org/10.1007/s10098-024-02890-3>
- 9.
10. Lin, X., Zhang, J., Ding, Y., Sun, G., Wei, Z., Philbin, S. P., & Guo, B. H. W. (2022). Assessing the impact of digital education and the role of the big data analytics course to enhance the skills and employability of engineering students. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.974574>
11. Mandalia, S. (2023). Tourism Education in the Digital Era: Navigating Innovation and Transformation. In *Advances in Social Science, Education and Humanities Research/Advances in social science, education and humanities research* (p. 509). https://doi.org/10.2991/978-2-38476-142-5_48
12. McGrath, G. M., Blaer, M., Ong, F., Lockstone-Binney, L., Wilson-Evered, E., & Whitelaw, P. (2021). Simulations in e-Tourism Learning and Management (p. 1). https://doi.org/10.1007/978-3-030-05324-6_48-1
13. Quaye, F. J., Kissi, M., & Hagan, P. (2025). Learning Beyond the Classroom: Exploring Tourism Students' Perception of Experiential Teaching Methods. *International Journal of Research and Scientific Innovation*, 693. <https://doi.org/10.51244/ijrsi.2025.12020059>
14. Rahmadian, E., Feitosa, D., & Virantina, Y. (2023). Digital twins, big data governance, and sustainable tourism. *Ethics and Information Technology*, 25(4). <https://doi.org/10.1007/s10676-023-09730-w>
15. Ruhanen, L., Axelsen, M., & Bowles, L. (2020). Engaging students through authentic learning: Connecting with international tourism partners. *Journal of Hospitality Leisure Sport & Tourism Education*, 29, 100291. <https://doi.org/10.1016/j.jhlste.2020.100291>
16. Schaffer, V. (2017). Enhancing learning to diverse cohorts via immersive visualization. *Journal of Hospitality Leisure Sport & Tourism Education*, 21, 46. <https://doi.org/10.1016/j.jhlste.2017.07.001>
17. Vrasida, M., & Vlaseros, V. (2025). (Big) Data Driven Strategic Decision-Making in Overtourism Management. In *Springer proceedings in business and economics* (p. 843). Springer International Publishing. https://doi.org/10.1007/978-3-031-81962-9_91
18. Wang, L. (2024). Enhancing Tourism Management through Big Data: Design and Implementation of an Integrated Information System. *Heliyon*, 10(20). <https://doi.org/10.1016/j.heliyon.2024.e38256>
19. Annelin, A., & Boström, G. (2024). Interdisciplinary perspectives on sustainability in higher education: a sustainability competence support model. *Frontiers in Sustainability*, 5. <https://doi.org/10.3389/frsus.2024.1416498>
20. Ara, A. F.-V., Guereño-Omil, B., & Ageitos, N. (2024). Embedding Sustainability in Tourism Education: Bridging Curriculum Gaps for a Sustainable Future. *Sustainability*, 16(21), 9286. <https://doi.org/10.3390/su16219286>
21. Chen, M., Pei, T., Jeronen, E., Wang, Z., & Xu, L. (2022). Teaching and Learning Methods for Promoting Sustainability in Tourism Education. *Sustainability*, 14(21), 14592. <https://doi.org/10.3390/su142114592>
22. Chen, T., Goodman, D., Morrison, A. M., & Wang, M.-J. (2023). International Internships, Language Competency, and Employability: Perceptions of and Gaps Between Students and Industry Stakeholders. *Advances in Hospitality and Tourism Research (AHTR)*, 11(3), 371. <https://doi.org/10.30519/ahtr.1133594>
23. Costa, M. da S. S., Ferreira, C. A. A., & Gavinolla, M. R. (2024). Accessible Tourism: A Review of Recent Research Trends and Future Agenda [Review of Accessible Tourism: A Review of Recent Research Trends and Future Agenda]. 37. https://doi.org/10.1007/978-3-031-45866-8_4
24. Deri, M. N., Zaazie, P., & Singh, A. (2023). Digital Future of the Hospitality Industry and Hospitality Education Globally. In *Springer international handbooks of education* (p. 1). Springer Nature (Netherlands).

https://doi.org/10.1007/978-981-99-3895-7_14-1

25. Liu, Y., Liu, J., & King, B. (2022). Intercultural communicative competence: Hospitality industry and education perspectives. *Journal of Hospitality Leisure Sport & Tourism Education*, 30, 100371. <https://doi.org/10.1016/j.jhlste.2022.100371>
26. Lucia, M. D., Dimanche, F., Giudici, E., Camargo, B. A., & Winchenbach, A. (2021). Enhancing tourism education: The contribution of humanistic management. *Humanistic Management Journal*, 6(3), 429. <https://doi.org/10.1007/s41463-021-00111-3>
27. Millar, M., Mao, Z., & Moreo, P. J. (2008). Hospitality Management Educators vs. the Industry: a Competency Assessment. <https://repository.usfca.edu/cgi/viewcontent.cgi?article=1006&context=hosp>
28. Pande, L., & Sengupta, S. (2024). Data Analytics in Smart Tourism Design: A review paper [Review of Data Analytics in Smart Tourism Design: A review paper]. *E3S Web of Conferences*, 556, 1038. *EDP Sciences*. <https://doi.org/10.1051/e3sconf/202455601038>
29. Pimentel, A. Jr. (2024). Unveiling the Barriers to Digital Transformation in Higher Education Institutions: A Systematic Literature Review. *Research Square (Research Square)*. <https://doi.org/10.21203/rs.3.rs-4970233/v1>
30. Price, E., Nicholson, D. T., Dunk, R. M., Lawler, C., Carney, M., Vargas, V. R., Veitch, S., Leigh, S., Singleton, M., & Mottram, S. (2024). Enabling change agents for sustainable development: a whole-institution approach to embedding the UN Sustainable Development Goals in higher education. *International Journal of Sustainability in Higher Education*, 25(7), 1333. <https://doi.org/10.1108/ijsh-02-2024-0112>
31. Quaye, F. J., Kissi, M., & Hagan, P. (2025). Learning Beyond the Classroom: Exploring Tourism Students' Perception of Experiential Teaching Methods. *International Journal of Research and Scientific Innovation*, 693. <https://doi.org/10.51244/ijrsi.2025.12020059>
32. Quintela, J. A., Durão, M., Veríssimo, M., & Marques, J. (2024). Tourism and Hospitality Internships in Higher Education: A Competency-Based Framework. In *Springer international handbooks of education* (p. 245). Springer Nature (Netherlands). https://doi.org/10.1007/978-981-97-4318-6_15
33. Ruhanen, L., Axelsen, M., & Bowles, L. (2020). Engaging students through authentic learning: Connecting with international tourism partners. *Journal of Hospitality Leisure Sport & Tourism Education*, 29, 100291. <https://doi.org/10.1016/j.jhlste.2020.100291>
34. Saggar, M., McArdle, J., Koning, A. de, & Choudhary, A. (2023). Designing Effective Experiential Curriculum: The Experiential Learning Map. *Imagining SoTL*, 3(2), 40. <https://doi.org/10.29173/isotl693>
35. Schaffer, V. (2017). Enhancing learning to diverse cohorts via immersive visualization. *Journal of Hospitality Leisure Sport & Tourism Education*, 21, 46. <https://doi.org/10.1016/j.jhlste.2017.07.001>
36. Schott, C., & Marshall, S. (2020). Virtual Reality for Experiential Education: A User Experience Exploration. *Australasian Journal of Educational Technology*, 96. <https://doi.org/10.14742/ajet.5166>
37. Selamat, S. M., Ali, A., Baharuddin, F. N., Musa, A. H., Nasir, H. M., & Beta, R. M. D. M. (2025). Aligning Academic Curriculum with Industry Demands: Dilemma of Graduates. *International Journal of Academic Research in Progressive Education and Development*, 14(3). <https://doi.org/10.6007/ijarped/v14-i3/25926>
38. Sung, S., Thomas, D., & Rikakis, T. (2024). Enacting Transdisciplinary Values for a Postdigital World: The Challenge-Based Reflective Learning (CBRL) Framework. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-024-00485-1>
39. Vialette, Y., Mao, P., & Bourlon, F. (2021). Le tourisme scientifique dans les Alpes françaises : Un laboratoire pour la médiation scientifique et la recherche. *Revue de géographie alpine*, 109(2). <https://doi.org/10.4000/rga.9337>
40. Azanza, G., Fernández-Villarán, A., & Goytia, A. (2022). Enhancing Learning in Tourism Education by Combining Learning by Doing and Team Coaching. *Education Sciences*, 12(8), 548. <https://doi.org/10.3390/educsci12080548>
41. Cepeda-Pacheco, J.C., Domingo, M.C. Deep learning and Internet of Things for tourist attraction recommendations in smart cities. *Neural Comput & Applic* 34, 7691–7709 (2022). <https://doi.org/10.1007/s00521-021-06872-0>
42. Ara, A. F.-V., Guereño-Omil, B., & Ageitos, N. (2024). Embedding Sustainability in Tourism Education: Bridging Curriculum Gaps for a Sustainable Future. *Sustainability*, 16(21), 9286. <https://doi.org/10.3390/su16219286>
43. Budeanu, A., Gyimóthy, S., Moya, A., Furunes, T., & Kvalsvik, L. K. (2024). Garbage Odysseys : Navigating the Fickle Institutional Context of Waste Management by Zanzibari Hotels. *Research Portal Denmark*, 51. <https://local.forskningportal.dk/local/dki-cgi/ws/cris-link?src=cbs&id=cbs-79c9c51d-bdca-40c8-84e2-4cabbab5cbe8&ti=Garbage%20Odysseys%20%3A%20Navigating%20the%20Fickle%20Institutional%20Context%20of%20Waste%20Management%20by%20Zanzibari%20Hotels>
44. Chen, M., Pei, T., Jeronen, E., Wang, Z., & Xu, L. (2022). Teaching and Learning Methods for Promoting Sustainability in Tourism Education. *Sustainability*, 14(21), 14592. <https://doi.org/10.3390/su142114592>
45. Deri, M. N., Zaazie, P., & Singh, A. (2023). Digital Future of the Hospitality Industry and Hospitality Education Globally. In *Springer international handbooks of education* (p. 1). Springer Nature (Netherlands). https://doi.org/10.1007/978-981-99-3895-7_14-1
46. Dredge, D., & Gyimóthy, S. (2017). Building our stories : Co-creating tourism futures in research, practice and education. In *Research Portal Denmark* (p. 144). Technical University of Denmark. <https://local.forskningportal.dk/local/dki-cgi/ws/cris-link?src=aa&id=aa-2764d3f3-3980-48ef-a4b2-5c8bc5fd70f0&ti=Building%20our%20stories%20%3A%20Co-creating%20tourism%20futures%20in%20research%20%20practice%20and%20education>
47. Hanshaw, G. (2024). Barriers to AI Course Assistant Adoption: Understanding Student Non-

Utilization at LAPU. Research Square (Research Square). <https://doi.org/10.21203/rs.3.rs-5378875/v1>

48. Jin, S. (2023). Unleashing the Potential of Social Media: Enhancing Intercultural Communication Skills in the Hospitality and Tourism Context. *Sustainability*, 15(14), 10840. <https://doi.org/10.3390/su151410840>

49. Liu, Y., Liu, J., & King, B. (2022). Intercultural communicative competence: Hospitality industry and education perspectives. *Journal of Hospitality Leisure Sport & Tourism Education*, 30, 100371. <https://doi.org/10.1016/j.jhlste.2022.100371>

50. Minohara, K., Muguruma, T., Tanizaki, Y., Gotoda, N., Lee, S., Aburatani, T., Yaegashi, R., & Kometani, Y. (2025). A Simulation-Based Decision Support System for MICE Event Design and Implementation in Blended Reality. In *Lecture notes in computer science* (p. 191). Springer Science+Business Media. https://doi.org/10.1007/978-3-031-93828-3_15

51. Moore, W., & Tsay, L.-S. (2024). From Data to Decisions: Leveraging AI for Proactive Education Strategies. *Proceedings of the International Conference on AI Research*, 4(1), 281. <https://doi.org/10.34190/icair.4.1.3082>

52. North, C., Hills, D., Maher, P., Farkić, J., Zeilmann, V., Waite, S., Takano, T., Prince, H., Gurholt, K. P., Muthomi, N., Njenga, D., Karaka-Clarke, T. H., Mackenzie, S. H., & French, G. (2023). The impact of artificial intelligence on adventure education and outdoor learning: international perspectives. *Journal of Adventure Education & Outdoor Learning*, 24(1), 123. <https://doi.org/10.1080/14729679.2023.2248302>

53. Okumuş, F., Niekerk, M. van, Köseoğlu, M. A., & Bilgihan, A. (2018). Interdisciplinary research in tourism. *Tourism Management*, 69, 540.

<https://doi.org/10.1016/j.tourman.2018.05.016>

54. Sharma, S., & Egger, R. (2025). Navigating the Digital Frontier: A Conceptual Framework for Data Science and Analytics Integration in Tourism Education and Research. <https://doi.org/10.21203/rs.3.rs-7874079/v1>

55. Strielkowski, W., Гребенникова, В., Lisovskiy, A., Rakhimova, G., & Vasileva, T. (2024). AI-driven adaptive learning for sustainable educational transformation. *Sustainable Development*. <https://doi.org/10.1002/sd.3221>

56. Teemu, M. (2023). Opportunities and Challenges of Artificial Intelligence in the Tourism Industry. *Deleted Journal*. <https://doi.org/10.19080/gjtlh.2023.01.555553>

57. Vaishnavi, S., & Ajit, I. (2024). Journeying Beyond Classroom Walls: Investigating the Impact of 360-Degree VR Videos in Fostering Experiential Learning in Tourism Education. *International Journal of Learning Teaching and Educational Research*, 23(5), 284. <https://doi.org/10.26803/ijlter.23.5.15>

58. Weichselbraun, A., Süsstrunk, N., Waldvogel, R., Glatzl, A., Braşoveanu, A., & Scharl, A. (2024). Anticipating Job Market Demands—A Deep Learning Approach to Determining the Future Readiness of Professional Skills. *Future Internet*, 16(5), 144. <https://doi.org/10.3390/fi16050144>

59. Zúñiga-Collazos, A., Orozco, J. M. V., & Ospina, A. R. (2025). Digital Competences and Their Impact on Employability in the Tourism Sector—An Applied Study. *Sustainability*, 17(13), 6133. <https://doi.org/10.3390/su17136133>