



Bridging Skills and Experience: The Role of Virtual Reality In Transforming Digital Learning For Vocational Tourism Training

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Abstract. Vocational education in tourism faces persistent challenges in bridging the gap between theory and practice, particularly in providing direct experiential learning and developing service-oriented skills. Conventional learning methods are often inadequate to meet the contextual and applied competencies required in the 21st century. This study presents a comprehensive review of bibliometric trends, key themes, and dimensions of Virtual Reality (VR) applications in transforming digital learning for vocational tourism training. Using a Systematic Literature Review (SLR) approach guided by the PRISMA protocol, data were collected from the Scopus database and filtered to 31 relevant articles published over the past three decades. The findings reveal a significant increase in VR-related research since 2020, with the highest citation impact originating from the United States and South Korea. Pedagogically, VR adoption is strongly linked to experiential and situated learning frameworks aimed at improving professional competence, cultural appreciation, and immersive learning engagement. VR has shown effectiveness across cognitive, affective, exploratory, and social learning dimensions, providing authentic experiences that promote motivation, understanding, and retention. Nevertheless, the study identifies ongoing challenges, including high implementation costs, limited teacher readiness, and inadequate infrastructure. The paper proposes a conceptual model for integrating VR into vocational tourism education to support digital transformation and future workforce readiness. The findings are expected to inform curriculum development, educational policy, and collaborative innovation among stakeholders in vocational education and tourism training.

Keywords: Virtual Reality, Vocational Education, Tourism Training, Digital Learning, Immersive Technology, Skills Development, Experiential Learning, Innovation in TVET.

1 Introduction

The development of digital technology has made a significant contribution to the paradigm shift in 21st-century education, particularly in terms of increasing learner engagement, personalizing learning, and creating more authentic learning experiences [1].

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One of the rapidly growing technologies that shows excellent potential in the field of education is Virtual Reality (VR). This technology allows users to interact with immersive and realistic three-dimensional virtual environments, thereby supporting experience-based and exploratory learning [2].

The use of VR in education has been explored in various domains, including science, engineering, medicine, and architecture, with benefits such as increased motivation, long-term retention, and enhanced abilities in abstract and spatial thinking [3]. In the context of vocational education (TVET), VR offers the ability to simulate real-world scenarios safely and efficiently, which was previously difficult to do directly due to cost, risk, or location limitations [4]. Several studies also highlight that VR supports constructivist, collaborative, and project-based learning, as well as providing more inclusive learning opportunities for learners with physical or geographical limitations [5]. However, the literature specifically discussing the application of VR in the context of vocational tourism training is still limited and fragmented.

Although many studies have been conducted on the benefits of VR in education in general, there is still a gap in terms of mapping bibliometric trends and global scientific collaboration related to the application of VR in vocational tourism training, in-depth exploration of how VR is revolutionizing digital learning practices in this field, and the identification of pedagogical approaches and learning dimensions consistently used in this context. This gap is important to bridge, considering that tourism is a sector that heavily relies on experiential learning, spatial visualization, and service skills areas that are well-suited to the advantages of VR. Digital transformation in the tourism and hospitality sector requires learning that is not only theoretical but also practical and relevant. VR technology has the potential to address these challenges through the simulation of tourist destinations, customer service training, and providing access to cultural sites that are not directly accessible [6]. Moreover, in the post-pandemic era, VR has become a remote learning solution that continues to provide a deep and interactive learning experience. This research aims to provide a comprehensive review of bibliometric trends, key roles, and dimensions of VR application in transforming digital learning in vocational tourism training, highlighting the pedagogical, technological, and instructional aspects that have emerged in the scientific literature over the past three decades. This research is designed to answer the following three research questions (RQs):

- (i) RQ1: How do trends in scientific production, journal distribution, and country contributions reflect differences in quantity and quality (citation impact) in the literature discussing the application of Virtual Reality (VR) for vocational tourism training based on data found in the Scopus database?
- (ii) RQ2: How do trends in the application of VR technology in vocational tourism training and experience development vary based on approach, objectives, and geographical context?
- (iii) RQ3: What are the methodological and pedagogical approaches used in studies of VR applications for vocational tourism training, and how are the dimensions of learning facilitated?

2 Method

This research employs the Systematic Literature Review (SLR) approach, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to systematically identify, screen, and select relevant articles. The literature review process consists of three main stages, as outlined in the PRISMA diagram, namely identification, screening, and inclusion, as illustrated in Figure 1.

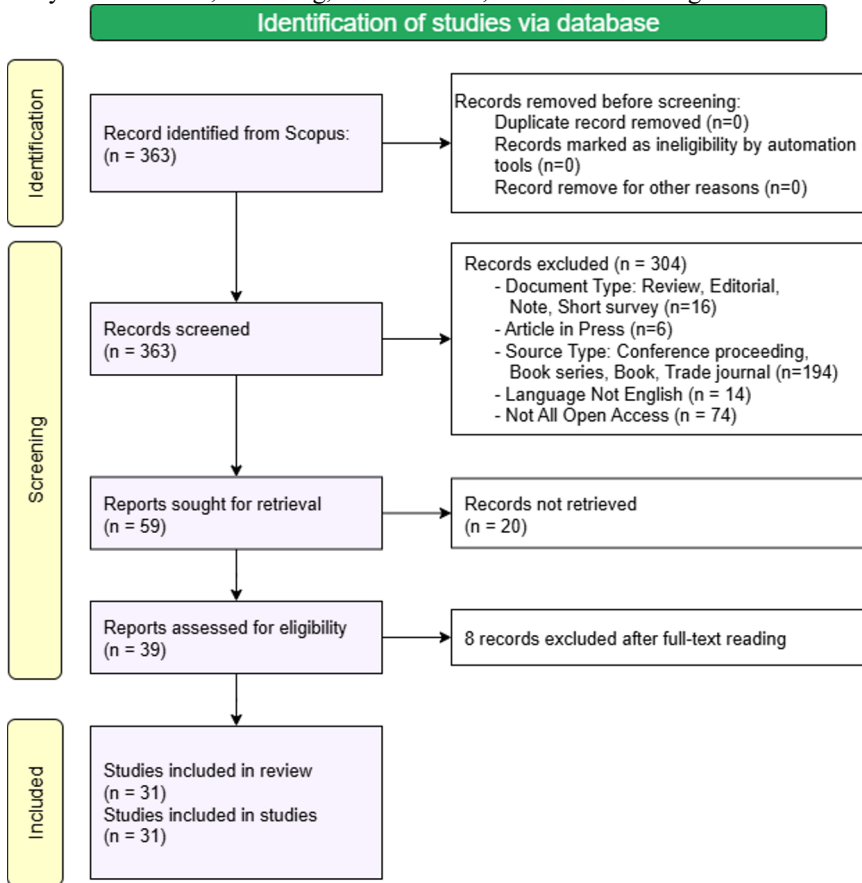


Fig. 1. Prisma Procedure.

Data collection was conducted on July 17, 2025, through the Scopus database, which was chosen due to its multidisciplinary coverage and reputation as a reputable scientific publication index [7]. From the initial search results, a total of 363 articles related to the use of Virtual Reality (VR) in vocational tourism training were obtained. After undergoing a screening process based on inclusion and exclusion criteria, 59 articles were selected for further review in full-text form. The exclusion criteria applied were as follows:

- (i) Document types such as review articles, editorials, brief notes, and short surveys (n = 16);
- (ii) Articles still in press status (n = 6);
- (iii) Non-journal sources such as conference proceedings, book series, books, trade journals (n = 194);
- (iv) Articles in non-English languages (n = 14);
- (v) Articles that are not fully open access (n = 74).

The inclusion and exclusion criteria established in the study are shown in Table 1. After a thorough evaluation of the article contents, 39 final articles that met the criteria were obtained and analyzed in depth. After that, we reanalyzed the full text of each article, resulting in 31 articles used to answer the research question. It should be noted that articles using literature review methods are not included in the further analysis, in order to ensure the focus of this study on original empirical research results.

Table 1. Inclusion and Exclusion Criteria.

Category	Inclusion Criteria	Exclusion Criteria
Document Type	Research articles (empirical and original)	Review articles, editorials, notes, short surveys
Publication Status	Articles that have been finalized and published	Articles in press (not yet finalized)
Source Type	Scientific journals indexed in Scopus	Conference proceedings, book series, books, trade journals
Language	English	Other languages
Accessibility	Open Access (full access to the complete text)	Closed articles (not open access)
Topic Relevance	Focus on the use of Virtual Reality (VR) in vocational tourism training	Topic not relevant to VR or not related to vocational education
Methodology Relevance	Using empirical approaches (qualitative, quantitative, mixed, case study, experiment)	Using literature review methods (pure review without field data)

As a result of the systematic screening and selection process based on inclusion and exclusion criteria, a total of 31 scientific articles were selected for in-depth analysis. These articles represent various methodological approaches, geographical backgrounds, and focus on the application of Virtual Reality (VR) technology in vocational tourism training. Table 2 summarizes the core information from each article, including the author's name, year of publication, research title, country of origin, methods used, and the primary focus of VR usage in the context of vocational digital learning.

Table 2. Summary of included articles.

No	Author	Title	Method	VR Focus
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1.	Antlej K. et al. (2023)	Understanding the Social Value of Geelong's Design and Manufacturing Heritage for Extended Reality	Survey	Tourism and Culture
2.	Ball C. et al. (2021)	Virtual reality adoption during the COVID-19 pandemic: A uses and gratifications perspective	Survey	Tourism and Culture
3.	Chen H.-S. et al. (2020)	The construction and validation of a sustainable tourism development evaluation model	Experiment	Tourism and Culture
4.	Griffin T. et al. (2022)	Exploring virtual reality experiences of slum tourism	Interview	Tourism and Culture
5.	Jung K. et al. (2020)	Meet the virtual jeju dol harubang: The mixed VR/Ar application for cultural immersion in Korea's main heritage	Experiment	Tourism and Culture
6.	Kleftodimos A. et al. (2023)	Creating Location-Based Augmented Reality Games and Immersive Experiences for Touristic Destination Marketing and Education	Experiment	Tourism and Culture
7.	Kougioumtzidis G. et al. (2023)	Deep Learning-Aided qoe Prediction for Virtual Reality Applications Over Open Radio Access Networks	Experiment	Tourism and Culture
8.	Li H. (2022)	3D Indoor Scene Reconstruction and Layout Based on Virtual Reality Technology and Few-Shot Learning	Experiment	Tourism and Culture
9.	Li J. et al. (2023)	Deepsea: a meta-ocean prototype for undersea exploration	Experiment	Tourism and Culture
10.	Liu A. et al. (2024)	3D Reconstruction and Virtual Reality Display Technology of Tourism Art Resources CAD Based on NN	Experiment	Tourism and Culture
11.	Liu Q. (2024)	Digital Transformation of Higher Education in China: Ways to Improve Academic Performance	Experiment	Learning and Training
12.	Liu X. et al. (2024)	The perceived coolness of using virtual reality technology in blended learning performance can improve learning motivation and learning satisfaction	Experiment	Learning and Training
13.	Livatino S. et al. (2023)	Photorealistic True-Dimensional Visualization of Remote Panoramic Views for VR Headsets	Observation	Tourism and Culture
14.	Luo Z. et al. (2023)	Achromatic diffractive liquid-crystal optics for virtual reality displays	Experiment	Tourism and Culture
15.	Torres Mas M. et al. (2022)	Digitization and virtual reality projects in archaeological heritage. The case of the archaeological site of motilla del azuer in daimiel (ciudad real)	Experiment	Preservation and Accessibility of Cultural Heritage
16.	Nie X. and Pu (2025)	Tourism Promotion Mechanism Based on Virtual Reality Technology for Real-life Interactive Experience	Experiment	Tourism and Culture

17.	Oppert D.M.L. et al. (2023)	Older adultsâ€™ experiences of social isolation and loneliness: Can virtual touring increase social connectedness? A pilot study	Interview	Tourism and Culture
18.	Oppizzi P. et al. (2023)	Geosites in the Gole della Breggia Geopark, Ticino, Southern Switzerland	Qualitative	Tourism and Culture
19.	Popescu D. et al. (2024)	Virtual front and educational impact: virtual reality effects in war tourism	Survey	Tourism and Culture
20.	Schott and Marshall (2021)	Full-immersion virtual reality for experiential education: An exploratory user experience analysis	Interview	Tourism and Culture
21.	Schott and Marshall (2018)	Virtual reality and situated experiential education: A conceptualization and exploratory trial	Experiment	Tourism and Culture
22.	Shen S. et al. (2022)	Exploring the factors influencing the adoption and usage of Augmented Reality and Virtual Reality applications in tourism education within the context of COVID-19 pandemic	Empirical Study	Tourism and Culture
23.	Su P.-Y. et al. (2023)	Investigating the Relationship between Usersâ€™ Behavioral Intentions and Learning Effects of VR System for Sustainable Tourism Development	Interview	Tourism and Culture
24.	Tan W. et al. (2021)	A method of VR-EEG scene cognitive rehabilitation training	Experiment	Tourism and Culture
25.	Tsai H.-Y. et al. (2022)	Comparative Evaluation of Different following Mechanisms in VR Guided Tour: A Preliminary Study	Experiment	Tourism and Culture
26.	Vaishnavi S. et al. (2024)	Journeying Beyond Classroom Walls: Investigating the Impact of 360-Degree VR Videos in Fostering Experiential Learning in Tourism Education	Survey	Tourism and Culture
27.	Van Nguyen S. et al. (2022)	Reconstruction of 3D digital heritage objects for VR and AR applications	Empirical Study	Tourism and Culture
28.	Veliz Sanca & Ccori Huamani (2024)	Automation of the Labeling Process Using an Image Classification Model Using Convolutional Neural Networks	Not Mentioned	Tourism and Culture
29.	Xing Y. et al. (2024)	Integrating restoration and interactive exploration to enhance cultural heritage through VR storytelling	Case Study	Learning and Training
30.	Yoon H. et al. (2022)	Impact of COVID-19 Pandemic on Virtual Korean Wave Experience: Perspective on Experience Economy	Survey	Tourism and Culture
31.	Zhu (2024)	Research on innovative methods of virtual reality course content for tourism education	Experiment	Tourism and Culture

3 Result and Discussion

3.1 Trends in Scientific Production, Local Journal Impact, and Global Influence of Countries in VR Research for Vocational Tourism

Based on the data in Figure 2, it is evident that interest in research on the application of VR in vocational tourism training has shown a significant upward trend over the past five years, particularly since 2020. This is most likely triggered by the increased need for immersive digital learning in response to mobility and access restrictions during the COVID-19 pandemic [8]. The peak of scientific production occurred in 2023, with a total of 9 articles, followed by 2024, which had eight articles. This suggests that the field is entering an emerging growth phase and is becoming a focus of multidisciplinary research, including in the contexts of educational technology, tourism, and digital cultural preservation.

The sharp decline observed in 2025 (with only 1 article) is not an indication of a general decrease in interest. However, it is somewhat more likely due to the data collection period not yet covering the entire year (with a cut-off in July). Therefore, the number of publications is expected to increase by the end of 2025. These findings indicate that research related to VR in vocational tourism training has gained significant momentum post-pandemic, with a sharp increase in both volume and diversity of approaches. This condition underscores the need for a systematic review to identify trends, research gaps, and opportunities for future multidisciplinary collaboration.

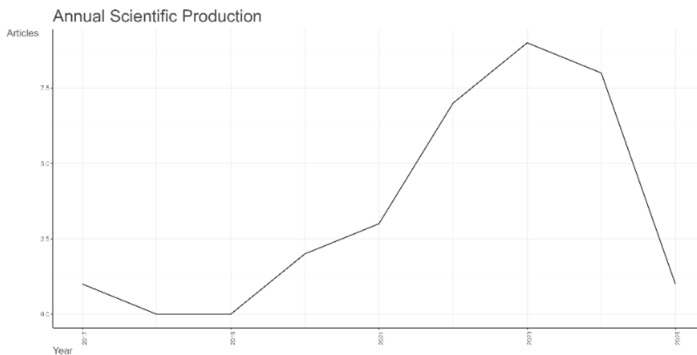


Fig. 2. Annual Scientific Production.

Based on the research development on the use of VR in vocational tourism training, the results of the word cloud-based visual analysis indicate that the term "virtual reality" significantly dominates, reflecting the primary focus of the research on immersive technology as a means of transforming learning. The terms "tourism," "education," "learning," and "sustainable development" also occupy central positions, indicating a close relationship between VR technology and the vocational education sector, particularly in the context of tourism training that emphasizes sustainability and experiential learning. The high frequency of words such as "climate change," "environmental impact,"

and "environmental planning" indicates that environmental aspects are gaining attention in the development of VR content for tourism, particularly in simulating the impacts of ecotourism and conservation. These findings reinforce the position of VR as a tool for environmentally conscious tourism education.

The emergence of the words "female," "male," "aged," and "aging" indicates that VR studies also explore user demographics, including cross-age and cross-gender learning experiences. Terms such as "loneliness," "social isolation," and "human experiment" suggest an examination of the emotional and social effects of VR usage, particularly in training scenarios that involve human interaction. Additionally, technical terms such as "image reconstruction," "three-dimensional computer graphics," "virtual environments," and "radio access networks" emphasize the involvement of advanced technological elements in VR content design. This indicates that the implementation of VR in tourism training is not only pedagogical but also requires synergy with innovations in the fields of graphics computing, networking, and augmented/mixed reality. Keywords such as "pilot study," "assessment method," and "adoption intention" suggest that most studies are still in the early exploration or early adoption stage, indicating a need for more in-depth, experimental, and longitudinal research.

Thus, this keyword map provides an overview that research on VR in vocational tourism training has developed towards a multidisciplinary approach, not only integrating aspects of technology, education, social, cultural, and environmental, but also showing room for deeper exploration, especially in terms of impact sustainability, learning personalization, and systemic integration in vocational curricula.



Fig. 3. Word cloud of research on the use of VR in vocational tourism training.

A bibliometric analysis of 31 articles published across 21 scientific journals reveals significant variation in the local impact of each source. Three journals with the highest number of publications ($NP \geq 2$) are shown in Table 3. The Journal of Hospitality, Leisure, Sport and Tourism Education stands out not only for its publication frequency but also for having the highest number of citations ($TC = 207$) with a balanced h-index and g-index (both = 2). This indicates that the journal has become a primary reference in the field of VR and vocational tourism training, particularly in the context of educa-

tion and the hospitality industry. Meanwhile, journals such as Telematics and Informatics (TC = 114), Light: Science and Applications (TC = 70), and ISPRS International Journal of Geo-Information (TC = 65), despite each containing only one article, have a high citation impact, indicating that the related articles have a significant individual influence (high local impact per publication). Journals with an m-index value of 0.5 or higher, such as Frontiers in Education, Sustainability (Switzerland), and the International Journal of Learning, Teaching and Educational Research, indicate that their articles have a relatively short-term impact since publication (time-normalized impact).

Table 3. Source Local Impact.

Element	h index	g index	m index	TC	NP	PY_start
Journal Of Hospitality, Leisure, Sport And Tourism Education	2	3	0,222	207	2	2017
Sustainability (Switzerland)	2	2	0,5	22	2	2022
Australasian Journal Of Educational Technology	1	1	0,2	44	1	2021
Computational Intelligence And Neuroscience	1	1	0,25	3	1	2022
Computers	1	1	0,333	9	1	2023
Frontiers In Education	1	1	0,5	2	1	2024
Geriatric Nursing	1	1	0,333	12	1	2023
Health Information Science And Systems	1	1	0,2	23	1	2021
Heritage	1	1	0,333	2	1	2023
Ieee Access	1	2	0,333	6	2	2023
Informatica (Slovenia)	1	1	1	1	1	2025
Information Technology And Tourism	1	1	0,333	5	1	2023
International Journal Of Environmental Research And Public Health	1	1	0,167	8	1	2020
International Journal Of Learning, Teaching And Educational Research	1	1	0,5	3	1	2024
Isprs International Journal Of Geo-Information	1	1	0,167	65	1	2020
Journal Of Information And Telecommunication	1	1	0,25	31	1	2022
Light: Science And Applications	1	1	0,333	70	1	2023
Resources	1	1	0,333	3	1	2023
Scientific Reports	1	1	0,5	4	1	2024
Telematics and Informatics	1	1	0,2	114	1	2021
Tourism Geographies	1	1	0,25	22	1	2022
Virtual Archaeology Review	1	1	0,25	10	1	2022

These findings suggest that interdisciplinary journals, such as Sustainability, IEEE Access, and Scientific Reports, are emerging as important platforms for disseminating studies on VR in the education and tourism sectors. Moreover, the highest local impact does not always come from globally reputable journals, but from journals that focus on vocational education, hospitality, and digital tourism. The local impact data source also shows that articles published in journals with a low h-index can achieve significant citations if the topic and contribution are relevant and applicable. Thus, the analysis results shown in Table 3 emphasize the importance of selecting journals relevant to the thematic context of the research, rather than solely relying on high bibliometric scores, to achieve maximum impact within specific scientific communities.

Analysis of the country of origin of publications reveals that several countries have a significantly high number of citations (Total Citations / TC), as shown in Table 4. The United States ranks second in terms of total citations (TC = 184), but has the highest average citations per article (92.00), indicating that studies from this country have a significant individual impact. Followed by South Korea (33.50) and Canada (22.00), which also show high performance per article. China recorded the highest number of articles (based on high TC, with an average of 17.6), indicating active involvement in production quantity, but with a more moderate average citation.

Table 4. Most Cited Countries.

Country	TC	Average Article Citations
CHINA	194	17,60
USA	184	92,00
KOREA	67	33,50
CANADA	22	22,00
AUSTRALIA	14	7,00
SPAIN	10	10,00
GREECE	9	9,00
BULGARIA	5	5,00
INDIA	3	3,00
ITALY	3	3,00
UNITED KINGDOM	1	1,00
PERU	0	0,00
ROMANIA	0	0,00

The most cited countries, such as China, the USA, and South Korea, are also major contributors to articles published in journals with high local impact, such as the Journal of Hospitality, Leisure, Sport and Tourism Education, Sustainability, and Telematics and Informatics. These findings reflect that the strength of national research is not only measured by the number of publications but also by their quality and impact, as indicated by the Average Citations per Article. Countries with low citation impact, such as India, Italy, Peru, and Romania, show growth potential but still require strengthening

in the context of research and international collaboration to enhance their visibility and scientific influence.

The United States and South Korea have become important benchmarks in terms of the quality of articles related to VR in tourism education, making them potential collaborative references or comparisons in future studies. Researchers from developing countries, including Indonesia, should consider collaboration strategies with institutions from the most highly cited countries to enhance publication quality and global visibility. Therefore, there is still a need to bridge the gap between quantity (as seen in China) and individual quality (as achieved by the USA and Korea).

Based on bibliometric findings, research on the use of VR in vocational tourism training has experienced significant growth since 2020, with a peak in production in 2023, and a distribution of publications across interdisciplinary journals and those focused on vocational education and digital tourism. Although journals with a low h-index can generate high citations, the strength of local impact still depends on the thematic relevance and the applicative contribution of the articles. While China is the most significant contributor quantitatively, the United States and South Korea record the highest citation impact per article, reflecting individual excellence in quality. These results underscore the importance of publication strategies that are not only quantity-oriented but also focus on strategic collaboration and the selection of appropriate scientific channels to maximize visibility and global impact in VR research and vocational education.

3.2 Trends in the application of VR technology in vocational tourism training and development based on approach, objectives, and geographical context

Based on a systematic review of 31 articles from the Scopus database, there are three important aspects examined to answer RQ2, namely: (1) learning approach, (2) objectives of using VR, and (3) geographical context of application. The majority of studies use experiential learning and situated learning approaches to create immersive experiences in tourism education. Experiential learning is the process of learning through experience [9]. Experiential learning is a learning process that utilizes experience as a medium for learning [10, 11]. Meanwhile, situated learning is an educational approach that emphasizes the acquisition of knowledge and skills through active participation in real-world contexts, cultures, and activities [12]. This approach emphasizes that the most effective learning occurs when participants directly experience authentic contexts, which in this case is represented through VR-based simulations.

Integrated VR with augmented reality and service design to enhance user behavioral intentions and learning effects in the development of sustainable tourism in Macau [13], immersive VR approach for underwater exploration, which can be applied in marine ecotourism training and environmental interpretation. Situational learning in environments resembling real-world conditions can enhance student engagement in tourism training [14]. Experiential learning in VR encourages deeper student engagement through contextual simulations of tourist destinations [15].

Examining the objectives of using VR in tourism education and training reveals three primary goals for applying VR in vocational tourism training. The primary objective is

to enhance professional tourism competencies. The use of VR enables the simulation of real-world work tasks, such as guiding virtual tours or managing hotels, as demonstrated in the automation of image classification for 360° tour experiences that enhance students' technical skills [16]. The second objective is the preservation of culture and heritage. VR is utilized to introduce cultural heritage sites through interactive narratives and AR/VR-based system designs, aiming to support the preservation and education of cultural heritage in tourist areas [17]. The ultimate objective is to combine simulation-based learning with real-life experiences. Several studies utilize VR to replicate real conditions of tourist destinations, including virtual field trips [18].

The geographical distribution of studies reveals the diversity of contexts and levels of technology adoption, encompassing East and Southeast Asia, with studies from Macau, Taiwan, and China highlighting the integration of VR in culture preservation-based training [13]. Eastern Europe and the Balkans, research by Kougioumtzidis et al. (2023) in Bulgaria, developed deep learning-based Quality of Experience (QoE) predictions for VR video streaming in 5G network-based tourism training [19].

The application of VR technology in vocational tourism training is rapidly developing, with an experiential-based pedagogical approach that focuses on strengthening technical skills, cultural preservation, and immersive place exploration. Geographically, Asia has become the central hub for the development of this technology, followed by Europe and South America.

3.3 Methodological and pedagogical approaches used in studies on the application of VR for vocational tourism training, and how the learning dimensions are facilitated

Methodologically, most studies employ a quantitative approach, utilizing models such as the Technology Acceptance Model (TAM), Generalized Structural Component Analysis (GSCA), and Partial Least Squares Structural Equation Modeling (PLS-SEM) to measure the effects of VR usage on behavioral intentions, user experience, and learning outcomes. Used the TAM model to evaluate JejuView [20]. This VR/AR application visualizes cultural heritage sites on Jeju Island, and found that hedonic value was more dominant than utilitarian value in the use of VR media. Meanwhile, another study employed a qualitative methodology, based on in-depth interviews and post-VR exposure reflections, to understand participants' perceptions of the reality of slum tourism [21]. This approach emphasizes situated experiential learning, where learning is directly linked to the social and cultural context of the destination. Some studies also adopt experimental methods to compare the learning effects between the group using VR and the control group. Interactive underwater model using a VR prototype and evaluated user engagement with exploratory narrative-based 3D scenarios [22].

Additionally, we conducted a pedagogical analysis of the learning dimensions, as shown in Table 5. Based on the recap in Table 5, it is evident that the application of VR in vocational tourism training is facilitated by various pedagogical approaches that contribute to diverse learning dimensions. The cognitive dimension dominates most studies (26 out of 31 articles), indicating that VR is consistently utilized to enhance the understanding, conceptual knowledge, and spatial representation of training participants.

This indicates that VR is capable of visualizing tourism learning content, such as local culture, historical sites, and tourism service procedures, in a concrete and realistic manner, thereby supporting memory reinforcement and the formation of new knowledge schemas.

The exploratory dimension is also very prominent, found in 22 out of 31 articles. This highlights the power of VR in providing immersive learning experiences that enable participants to explore virtual environments that resemble the real world. For example, some studies design interactive simulations for tourist destinations or virtual museum spaces that users can freely explore. This approach provides freedom and autonomy in learning, while also encouraging curiosity and reflection on the displayed tourist context.

Meanwhile, the affective dimension, which involves feelings, motivation, and emotional engagement, appears in 15 articles. Affective engagement is crucial in the context of tourism training because VR's ability to evoke positive emotions, increase interest, and foster empathy towards visitors or local communities presented in the simulation is important. Regarding the social dimension, although it is not as prevalent as the other dimensions, it remains significant, with findings from 11 studies. This dimension usually appears in the context of collaborative learning, user interactions in the virtual world, or the depiction of social interactions at virtual tourist destinations. Position VR as a medium to bridge cross-cultural understanding and facilitate social discussions in the context of tourism training based on cultural heritage [23, 24].

From the overall data, it can be concluded that VR in vocational tourism training not only serves as a cognitive visualization aid but also as a pedagogical tool that strengthens the affective, exploratory, and social dimensions. This suggests that the integration of VR should be designed comprehensively, considering not only technological and content aspects but also adopting a holistic pedagogical approach, so that vocational tourism learning becomes more meaningful, authentic, and lasting.

Table 5. Pedagogical Approaches to Using VR for Vocational Tourism Training.

No	Author	Learning Dimensions
1	Antlej K. et al. (2023).	Cognitive, Social, Exploratory
2	Ball C. et al. (2021).	Cognitive, Social
3	Chen H.-S. et al. (2020).	Cognitive
4	Griffin T. et al. (2022).	Cognitive, Affective, Social, Exploratory
5	Jung K. et al. (2020).	Cognitive, Exploratory
6	Kleftodimos A. et al. (2023).	Cognitive, Affective, Exploratory
7	Kougioumtzidis G. et al. (2023).	Cognitive, Affective, Exploratory
8	Li H. et al. (2022).	Cognitive, Exploratory
9	Li J. et al. (2023).	Cognitive, Exploratory
10	Liu A. et al. (2024).	Cognitive, Exploratory
11	Liu X. et al. (2024).	Cognitive, Affective
12	Livatino S. et al. (2023).	Affective, Exploratory

13	Luo Z. et al. (2023).	Cognitive
14	Nie X. et al. (2025).	Exploratory
15	Oppert D.M.L. et al. (2023).	Cognitive, Affective, Social, Exploratory
16	Popescu D. et al. (2024).	Cognitive, Social
17	Schott C. et al. (2021).	Cognitive, Affective, Exploratory
18	Schott C. et al. (2018).	Cognitive, Affective, Social, Exploratory
19	Shen S. et al. (2022).	Cognitive, Affective
20	Su P.-Y. et al. (2023).	Cognitive, Affective, Exploratory
21	Tan W. et al. (2021).	Cognitive
22	Tsai H.-Y. et al. (2022).	Cognitive, Exploratory
23	Vaishnavi S. et al. (2024).	Cognitive, Exploratory
24	Veliz D. et al. (2024).	Social, Exploratory
25	Xing Y. et al. (2024).	Cognitive, Exploratory
26	Yoon H. et al. (2022).	Cognitive, Social, Exploratory
27	Zhu Z. et al. (2024).	Cognitive, Affective, Social, Exploratory

4 Conclusion

This study presents a systematic review of the application of Virtual Reality (VR) technology in vocational tourism training, by examining 31 scientific articles published between 2015 and 2025. The analysis results show that VR has a significant contribution in bridging the gap between theoretical learning and practical skills, particularly through experiential learning and situated learning approaches. Specifically, VR has been proven to support the improvement of learning outcomes in cognitive dimensions (conceptual, spatial, and procedural understanding), affective dimensions (motivation and emotional engagement), exploratory dimensions (free exploration in virtual environments), and social dimensions (interaction and cultural empathy). The cognitive and exploratory dimensions emerge as dominant, affirming the role of VR in enhancing spatial and contextual thinking abilities that are crucial in the tourism sector. However, the adoption of VR still faces implementation challenges, such as the high cost of content development, limited training for instructors, and uneven digital infrastructure. Additionally, studies originating from developing countries remain minimal, resulting in a gap in the geographical diversity of research. Based on these findings, it is recommended that vocational education institutions begin to design curricula that strategically integrate VR with the needs of the tourism industry; the government and industry support the provision of infrastructure and training resources; researchers subsequently conduct field-based experimental studies to measure the effectiveness of VR implementation in real learning settings; and international collaboration is expanded to enhance the quality and visibility of research from regions with low technology adoption. Thus, the utilization of VR in vocational tourism training is not merely a technological

innovation, but also a strategic step towards transforming digital education into a contextual, immersive, and relevant approach that meets the demands of the future tourism industry.

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