

THE TEACHING DESIGN OF SMART CLASSROOMS FOR TOURISM MANAGEMENT COURSES IN COLLEGES AND UNIVERSITIES IN THE "NEW INFRASTRUCTURE" ENVIRONMENT

Yue Wang, Lei Bai*

School of Economics and Management, Jilin Engineering Normal University, Changchun 130052, Jilin, China.

**Corresponding Author: Lei Bai*

Abstract: Against the backdrop of the comprehensive promotion of new infrastructure and the accelerated digital transformation of the cultural tourism industry, traditional teaching methods in tourism management majors in universities face issues such as rigid teaching modes, limited practical training, and superficial technology integration, making it difficult to meet the industry's demand for composite digital cultural tourism talents. Supported by theories such as connectivism, situated cognition, and experiential learning, this paper analyzes the inherent adaptability of new infrastructure and the smart classroom for tourism management majors. Combining the practical and scenario-based characteristics of the major, it constructs a four-ring interconnected smart classroom teaching design framework: cloud-based departure, virtual-real integration, data-driven, and collaborative co-creation. It establishes three-dimensional teaching objectives: knowledge construction, digital operation ability, and innovative thinking, and designs a full-process smart teaching model and a diversified comprehensive evaluation system before, during, and after class. The study finds that new infrastructure technology can effectively break the barriers of traditional teaching space, time, and scenario, achieving deep integration of technology, curriculum, and teaching. In response to challenges such as uneven resource allocation, insufficient digital literacy of teachers, technical application deviations, and data security risks that arise during implementation, this paper proposes optimization measures from four aspects: resource sharing, teacher cultivation, teaching philosophy, and institutional construction. The research aims to promote the transformation and upgrading of teaching modes in tourism management majors, provide reference for the implementation of smart classrooms, and assist universities in cultivating high-quality professionals suitable for the development of digital cultural tourism.

Keywords: New infrastructure; Tourism management; Smart classroom; Instructional design

1 INTRODUCTION AND PROBLEM STATEMENT

1.1 New Infrastructure Empowers the In-depth Development of Smart Education

The new infrastructure construction, centered around 5G mobile communication, artificial intelligence, big data centers, and the Internet of Things, has reshaped the digital development landscape of education in China, providing hardcore technical support for the implementation of smart education. The Ministry of Education has continuously promoted the construction of "smart education demonstration zones" and clearly stated that relying on new infrastructure technology will drive the innovation of classroom teaching modes and the upgrading of talent cultivation systems in universities, thereby facilitating the digital transformation of higher education. Against the backdrop of comprehensive digitalization and intelligent upgrading in the cultural tourism industry, new business forms such as smart scenic spots, digital cultural tourism, and cloud tourism have rapidly emerged. The market urgently needs composite cultural tourism talents who possess both professional tourism knowledge and digital technology application skills, posing new requirements for the cultivation of tourism management talents in universities [1].

1.2 Pain Points in Traditional Tourism Management Course Teaching

Currently, there are still significant shortcomings in the teaching of tourism management courses in domestic universities, with prominent issues of rigid traditional teaching models. Most courses are primarily focused on theoretical instruction, and practical teaching components are weak, leading to a serious disconnect between theoretical knowledge and practical industry applications. Teaching methods are single and rigid, with insufficient application of intelligent teaching tools and digital technologies, making it difficult to adapt to the digital development pace of the cultural tourism industry. At the same time, tourism majors are highly practical and scenario-based. Traditional offline practical training is limited by time, space, and equipment, making it difficult to regularly carry out practical training content such as on-site teaching in scenic spots, practical operation of cultural tourism projects, and handling of unexpected scenarios. This limits the cultivation of students' practical operation and scenario adaptability abilities, resulting in a gap between the quality of talent cultivation and industry job demands.

1.3 Existing Difficulties and Research Significance of Integrating Smart Classroom Teaching

As a new teaching form of "Internet plus education", smart classrooms have been gradually popularized across multiple majors in universities. However, there exists a superficial problem in the design of smart classroom teaching for tourism management majors. Most teaching merely utilizes smart devices as multimedia display tools for courseware playback and video presentation, failing to deeply integrate core technologies of new infrastructure such as 5G, big data, and AI, and thus not fully unleashing the dividends of technology in education [2]. The integration of technology with course teaching and talent cultivation remains superficial. Based on this, this paper, grounded in the development context of new infrastructure and combined with the characteristics of tourism management majors, explores a specialized and systematic design scheme for smart classroom teaching. By sorting out theoretical adaptation logic, constructing a closed-loop teaching framework, and solving implementation challenges, it promotes the transformation and upgrading of teaching modes in tourism management majors, assisting universities in cultivating composite talents suitable for the digital cultural tourism era [3]. This paper follows a research approach of "theoretical tracing - adaptation analysis - framework construction - problem optimization" to progress layer by layer in completing this teaching design research.

2 THEORETICAL LOGIC OF NEW INFRASTRUCTURE EMPOWERING SMART CLASSROOMS AND ITS ADAPTABILITY TO TOURISM MAJORS

2.1 The Core Connotation of New Infrastructure and Smart Classroom

Different from traditional infrastructure, new infrastructure focuses on digital technology empowerment. Its core encompasses three dimensions: information infrastructure, integrated infrastructure, and innovative infrastructure, providing comprehensive technical support and scenario guarantees for the construction of smart classrooms. Among them, information infrastructure, centered around 5G networks, big data centers, artificial intelligence platforms, and Internet of Things systems, serves as the basic carrier for the operation of smart classrooms, ensuring efficient and stable classroom data transmission, intelligent computing, and resource storage. Integrated infrastructure leverages digital technology to transform traditional educational facilities, creating smart classrooms, virtual simulation training bases, and cloud-based teaching platforms, achieving deep integration of technology and teaching scenarios. Innovative infrastructure primarily consists of educational digital research and development platforms, teaching innovation laboratories, and school-enterprise collaborative innovation centers, providing innovative support for the innovation of teaching modes and the optimization of teaching design in smart classrooms. The complete smart classroom system consists of three modules: smart teaching environment, smart teaching mode, and smart teaching evaluation. Relying on new infrastructure technology, it breaks the traditional time and space constraints of teaching, realizes intelligent supply of teaching resources, dynamic control of teaching processes, and precise implementation of teaching evaluation, building a new teaching ecosystem featuring human-machine collaboration.

2.2 Core Theoretical Support for the Construction of Smart Classrooms

New infrastructure empowers the construction of smart classrooms for tourism management majors, forming a complete theoretical system based on three classic educational theories to provide scientific basis for teaching design.

Firstly, the theory of connectivity emphasizes that learning is a process of knowledge connectivity, resource connectivity, and interpersonal connectivity. The cloud platform and network technology of new infrastructure can break down barriers between campuses, industries, and regions, enabling the interconnection of university teaching resources, enterprise industry resources, and cutting-edge scientific research resources, thereby broadening students' knowledge acquisition channels.

Secondly, the theory of situated cognition points out that learning needs to be carried out in real-life scenarios. Immersive and contextual learning environments can help learners deeply understand knowledge and master skills. Traditional tourism teaching scenarios are single, while new infrastructure technology can construct highly simulated cultural tourism teaching scenarios, allowing students to internalize knowledge in real-life situations.

Finally, the theory of experiential learning by Kolb believes that learning is a closed-loop process of "experience-reflection-abstraction-application". The strong practicality of the tourism management major highly aligns with this theory [4]. Smart teaching modes such as VR/AR virtual training, 5G remote live teaching, and big data case analysis can provide students with immersive experience scenarios, promoting students to shift from passive listening to active experiencing, practical operation, and reflection, thus achieving the practical application and innovative upgrading of skills. Meanwhile, the theory of embodied cognition further supports that physical immersive experience is the core path of knowledge construction. The virtual-real integrated teaching scenarios created by new infrastructure allow students to fully participate in practical operation experiences, enhancing cognitive effects.

2.3 The Compatibility between New Infrastructure and Tourism Management Major

The tourism management major possesses core characteristics of strong practicality, evident spatial and temporal constraints, and prominent service interactivity. It is highly compatible with the smart classroom model empowered by new infrastructure, effectively addressing the pain points of traditional professional teaching.

From the perspective of professional characteristics, the core skills of tourism management encompass scenic spot operation, tourism services, emergency response, route planning, etc., all of which require practical training based on real-life scenarios. However, in traditional teaching, field teaching in scenic spots is costly and infrequent, and it is difficult to conduct on-site observation and learning in remote cultural tourism scenarios and niche cultural tourism resources. The constraints of time and space greatly limit the effectiveness of practical training. At the same time, the core of tourism services lies in human-computer interaction and customer service. Traditional classrooms cannot simulate complex tourist service scenarios and sudden dispute scenarios, resulting in insufficient cultivation of students' service thinking and adaptability.

New infrastructure technology precisely solves the above problems and achieves comprehensive upgrading of professional teaching. 5G+ holographic projection technology enables live remote broadcasting in scenic spots and cultural tourism enterprises, breaking geographical constraints and allowing students to observe frontline operational scenarios and learn industry practical norms in real time. VR/AR virtual simulation technology can create virtual scenic spots, smart hotels, tourism business districts, and other scenarios, reproducing the entire process of tourism services, scenic spot management, and crisis handling. Students can engage in immersive training repeatedly, avoiding the costs and safety issues of on-site training [5]. AI teaching assistants can provide personalized answers and targeted skill guidance based on students' learning progress and practical shortcomings, achieving individualized teaching. Big data technology can capture tourist flow data, tourist consumption data, and cultural tourism operation data, transforming them into classroom teaching cases. This allows students to rely on real industry data for management decision-making and market analysis training, meeting the digital operation needs of the industry.

In summary, the deep integration of new infrastructure technology and tourism management professional teaching has completely changed the traditional theoretical and singular teaching mode, enabling contextualized, immersive, and practical learning. It perfectly aligns with the core needs of tourism management professional talent cultivation and lays a solid foundation for subsequent smart classroom teaching design.

3 CONSTRUCTION OF A SMART CLASSROOM TEACHING DESIGN FRAMEWORK FOR TOURISM MANAGEMENT MAJOR BASED ON NEW INFRASTRUCTURE

3.1 Core Framework of the Four-Linkage Teaching Design

This article leverages the technological advantages of new infrastructure and the adaptive characteristics of tourism majors to construct a four-ring interconnected smart classroom teaching design framework, namely "Cloud Departure - Virtual and Real Integration - Data-driven - Collaborative Co-creation". This framework connects the entire teaching process before, during, and after class, achieving deep integration of technology, content, teaching, and evaluation, and creating a closed-loop smart teaching system. This framework abandons the traditional single mode of knowledge impartation, supported by new infrastructure hardware facilities and digital technology, with the cultivation of digital cultural tourism talents as the core. It integrates four major modules: teaching objectives, teaching content, teaching process, and teaching evaluation, forming a comprehensive and three-dimensional smart teaching pattern that adapts to the talent needs of the digital cultural tourism industry [6].

3.2 Three-dimensional Teaching Objectives and Digital Content Reconstruction

Based on the educational advantages of new infrastructure, this article upgrades the traditional single knowledge-based teaching goal to a three-dimensional teaching goal of "knowledge construction + digital operation ability + innovative thinking", aiming to comprehensively enhance the quality of talent cultivation. At the level of knowledge construction, the core theoretical knowledge of tourism management is retained to strengthen students' professional foundation. At the level of digital operation ability, emphasis is placed on cultivating students' core abilities such as big data analysis, virtual scene practice, smart tourism and culture platform operation, and digital tourism and culture product design [7]. At the level of innovative thinking, relying on digital scenarios and new industry formats, students are cultivated in innovative thinking for tourism and culture integration, digital service innovation, and operation mode innovation. In terms of teaching content, we rely on the big data center to explore the latest business models and real-life operational cases in the cultural tourism industry, replacing outdated textbook content. For instance, we capture real-time passenger flow, consumption, and operation and maintenance data of scenic spots, design simulation projects for tourism scenic spot management decision-making, and enable students to optimize operational plans based on real data. Simultaneously, we develop a series of virtual simulation experiment projects, covering practical training content such as hotel front desk crisis management, emergency response to unexpected events in scenic spots, smart tourism route planning, and digital design of cultural tourism products. These projects aim to compensate for the shortcomings of traditional practical training and achieve precise alignment between teaching content and industry frontiers [8].

3.3 Implementation of Full-process Smart Teaching and Diversified Evaluation

In the process of teaching implementation, relying on new infrastructure resources such as smart teaching platforms, 5G networks, AI systems, and VR equipment, a full-process smart teaching model is established for before, during, and after class.

Before class, teachers push micro-courses, preview courseware, and industry frontier information through the cloud-based intelligent teaching platform. Relying on the AI learning diagnosis system, they analyze students' weak spots in knowledge and precisely deliver personalized learning resources, completing the preliminary assessment of students' learning situation and laying the foundation for knowledge before class.

During the class, relying on 5G holographic interconnection technology, mentors from cultural and tourism enterprises are connected to achieve collaborative teaching between schools and enterprises on the cloud. Students are grouped into virtual simulation teaching scenarios to complete practical tasks such as creative design of tourism routes, handling of sudden disputes in scenic spots, and intelligent hotel services. The entire process is recorded through an intelligent recording and broadcasting system, which records students' operational behaviors, group interaction processes, and practical training results, facilitating post-class review and optimization.

After class, AI-based correction systems are utilized to intelligently correct homework and practical training reports. By combining students' classroom performance and practical operation data, learning reports are generated. Based on these reports, personalized expansion tasks and industry practical training cases are targetedly pushed out to reinforce knowledge consolidation and enhance ability improvement [9].

In terms of teaching evaluation, we break away from the traditional single-final-exam assessment model and establish a multi-dimensional student ability portrait evaluation system based on learning data analysis. This system encompasses diverse indicators such as classroom interaction, virtual training completion, data analysis accuracy, scheme innovation, and team collaboration, achieving a combination of process evaluation and outcome evaluation, as well as a fusion of quantitative evaluation and qualitative evaluation. Taking the course "Tourism Planning and Development" as an example, teaching is conducted relying on a digital twin scenic spot platform. Students complete tasks such as scenic spot planning, business layout, and passenger flow optimization in the role of professional planners. The system provides real-time feedback on operational issues and shortcomings in the plan. Teachers conduct comprehensive evaluations based on platform data and student outcomes, comprehensively enhancing the relevance and effectiveness of teaching. The entire teaching design relies on new infrastructure hardware support such as smart classrooms, VR training equipment, big data teaching platforms, and 5G full-coverage campus networks to ensure efficient implementation of each teaching link.

4 IMPLEMENTATION CHALLENGES, COUNTERMEASURES, AND CONCLUSION

4.1 Core Challenges in Implementing Smart Classrooms under the New Infrastructure

Although the new infrastructure empowers the construction of smart classrooms for tourism management majors with significant advantages, it still faces multiple practical difficulties in the process of implementation.

Firstly, there is an imbalance in new infrastructure resources between regions and schools. There is a significant gap between universities in the eastern and western regions, as well as between urban and rural universities, in terms of smart classroom construction, VR training equipment configuration, and big data teaching platform establishment. The uneven distribution of high-quality digital teaching resources can easily exacerbate the digital divide in education, leading to uneven implementation of smart classroom reforms.

Secondly, teachers lack digital teaching capabilities. Most professional teachers possess solid tourism-related knowledge, but they lack TPACK (Technological Pedagogical Content Knowledge) ability to integrate technology into teaching. They are not proficient in operating new infrastructure equipment, designing smart teaching, developing digital resources, analyzing data and learning situations, and other skills, making it difficult to achieve deep integration of technology and curriculum.

Thirdly, there is a misconception of "technology supremacy" in teaching implementation. Some universities unilaterally pursue intelligent equipment and digital scenarios, excessively piling up technical means, ignoring the core of professional teaching content, and exhibiting a problem of emphasizing formality over connotation, which violates the essence of intelligent teaching and education.

Fourthly, there are potential risks to the security of teaching data. During the operation of smart classrooms, a large amount of student learning data, practical training outcome data, and industry cooperation data will be accumulated. However, there is a lack of comprehensive security standards in the data collection, storage, and application processes, posing risks of privacy leakage and data abuse.

4.2 Optimization Strategies for the High-quality Implementation of Smart Classrooms

In response to the aforementioned implementation challenges, and in consideration of the practical teaching situation of the tourism management major, targeted optimization measures are proposed.

Firstly, we should promote the co-construction and sharing of new infrastructure resources. The government should take the lead in coordinating regional digital education resources, building a cloud-based virtual simulation experimental teaching sharing platform, and facilitating the cross-regional and cross-university circulation of high-quality smart teaching resources. This will compensate for the hardware resource shortages in remote areas and grassroots universities, and narrow the digital divide.

Secondly, we should strengthen the cultivation of teachers' digital teaching capabilities, regularly carry out special training on teachers' TPACK capabilities, focus on core content such as the application of new infrastructure technology, smart classroom teaching design, digital curriculum development, and data-based teaching evaluation, build a platform

for school-enterprise exchanges, and organize teachers to learn industry digital technology in-depth from cultural tourism enterprises, thereby enhancing teachers' abilities in industry-education integration and technology-education integration.

Again, we must establish a scientific teaching philosophy, adhere to the core principle of "content-based, technology-enhanced", clarify the positioning of technology serving teaching and empowering education, eliminate the behavior of showing off technology, design smart teaching links around the talent cultivation goals and core course content of tourism management major, and achieve precise adaptation between technology and teaching.

Finally, we should improve the teaching data security management system, establish standards for the entire process of intelligent teaching data collection, storage, application, and confidentiality, clarify data usage permissions, strengthen the data security defense line, and ensure the privacy of teacher and student data as well as the security of industry data.

4.3 Research Summary and Future Outlook

In summary, the rapid development of new infrastructure provides revolutionary technical support and scenario guarantees for the construction of smart classrooms in tourism management majors at universities, completely breaking the spatial and temporal constraints, scenario limitations, and resource restrictions of traditional teaching. The scientific four-ring linkage smart classroom teaching design can achieve deep integration of digital technology and tourism professional teaching, building a new teaching ecosystem featuring "combination of human and technology, integration of industry and education, and complementarity of virtual and real worlds", effectively solving problems such as the disconnect between traditional teaching theory and practice, insufficient practical training scenarios, and lagging talent cultivation, and helping universities cultivate compound and innovative talents suitable for the new format of digital cultural tourism. In the future, with the continuous iteration of technologies such as the metaverse, large AI models, and digital twins, the smart classroom for tourism management majors will upgrade towards immersive metaverse classrooms, AI-based personalized and precise teaching, and collaborative teaching across schools and enterprises, further promoting the digitalization, intelligence, and high-quality development of tourism management education, and continuously supplying high-quality talents for the transformation and upgrading of the cultural tourism industry.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

FUNDING

This paper is sponsored by project fund from Leading Group Office of Jilin Provincial Educational Science (Project title: Research on the Teaching Design and Application of Smart Classroom for Tourism Management Courses in Higher Education Institutions under the Environment of "New Infrastructure"; Contract NO. GH21292). Additionally, it is also a phased achievement of the school-level teaching and research project "Research on the Construction and Application of Smart Classrooms for 'Tourism Economics' Courses Based on Teaching Informatization". It has also received funding from the Institute of Higher Education Research at Jilin Engineering Normal University.

REFERENCES

- [1] Lei Lei, Wang Ti, Xu Xiaoyue. The Construction Path of Smart Classroom Teaching Mode in Colleges and Universities in the Age of Artificial Intelligence. *Shanxi Youth*, 2026(9): 33-35.
- [2] Li Qinggang, Wu Caiju, Yang Peipei. Exploration of Integrated Smart Classrooms in Universities Empowered by AI. *New Generation Information Technology*, 2026, 9(5): 43-49.
- [3] Ma Jinzhong, Tan Boshen, Dai Mohan. Research on the Construction and Application of Knowledge Graph for Smart Classrooms. *China Educational Technology and Equipment*, 2026(6): 34-37.
- [4] He Dan, Ding Juan, Shan Yongfu. Research on the Implementation Path of Precise Teaching in Smart Classrooms under the Background of Big Data. *China Strategic Emerging Industries*, 2026(9): 152-154.
- [5] Luo Yingxia. Application of New-generation Information Technology in the Construction of Smart Classrooms in Universities. *China Informatization*, 2026(3): 147-148.
- [6] Xu Jie. Research on the Construction Logic and Practical Path of Smart Classroom Field under the Concept of Symbiotic Education. *Shanxi Youth*, 2026(4): 13-15.
- [7] Meng Yaling, Qiu Ping, Sui Kunjie. Research on Intelligent Classroom Behavior Analysis System Based on Artificial Intelligence. *Educational Information Technology*, 2026(Z1): 13-17.
- [8] Zhou Wanqing. Research on the Teaching Design of Smart Classrooms for Tourism Management Majors in Colleges and Universities in the 5G Era. *Scientific Consultation*, 2022(15): 136-138.
- [9] Zhang Caifei, Wang Yue. Research on the Teaching Design of Smart Classrooms for Tourism Management Majors in Colleges and Universities in the 5G Era. *China Management Informatization*, 2020, 23(20): 222-223.