

Intelligent Technology-Driven Teaching Innovation in University Aesthetic Education—A Case Study of “Digital Photography Technology and Art” at Southwest Petroleum University

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How to cite this paper: Zhao, L., Zhang, G.L., Qiao, S.J. and Wang, Q. (2026) Intelligent Technology-Driven Teaching Innovation in University Aesthetic Education—A Case Study of “Digital Photography Technology and Art” at Southwest Petroleum University. *Journal of Computer and Communications*, 14, 1-16.

<https://doi.org/10.4236/jcc.2026.145001>

Received: April 16, 2026

Accepted: May 11, 2026

Published: May 14, 2026

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Abstract

With the vigorous development of new-generation artificial intelligence large mode, AI technology has emerged as a pivotal driving force behind the new round of technological revolution and industrial transformation, propelling human society into an intelligent new era characterized by human-machine collaboration, cross-boundary integration, and co-creation and sharing [1]. In the advancement of aesthetic education in higher education institutions, photography courses currently face critical challenges, including the scarcity of teaching resources, outdated pedagogical methods, and the absence of personalized learning for students. This study takes the Digital Photography Technology and Art course at Southwest Petroleum University as a case to explore an innovative path for empowering information-based teaching of aesthetic education courses through intelligent technology. The course was delivered to three learner groups: on-campus undergraduates (experimental group), remote learners from partner institutions, and open-access public users (control group). An intelligent instructional system was constructed by integrating the “M + LIF” teaching model, the AIRVC intelligent-agent framework, a personalized knowledge graph, and VR-supported teaching resources. A mixed-methods evaluation combining online questionnaires and platform learning-record analysis was employed, yielding 763 valid responses, and learning outcomes between the experimental and control groups were compared. Empirical results show that the mean course score of the experimental group was 5.14 points higher than that of the control group; 87.63% of students reported that

personalized resource recommendations significantly enhanced their learning interest; and the course pass rate rose from 41.3% to 63.9%, with the online dropout rate decreasing by 19.39%. The findings indicate that the personalized teaching model supported by intelligent technology can effectively improve the teaching quality and learning experience of aesthetic education courses, offering a scalable, practical solution for the digital transformation of aesthetic education in higher education.

Keywords

Intelligent Technology, Aesthetic Education in Higher Education, Technology-Enhanced Teaching, Personalized Learning

1. Introduction

Amidst the rapid evolution of artificial intelligence technology, the education sector is undergoing profound transformation [2]. The integration of AI technologies has opened new possibilities for photography education, enabling the deep infusion of digital technologies into school-based aesthetic education. By leveraging tools such as artificial intelligence, big data, and virtual reality to innovate pedagogical models, this approach aims to construct an open and shared digital resource repository for aesthetic education, thereby addressing persistent challenges in traditional aesthetic education, including uneven distribution of resources and pedagogical homogenization [3].

Digital Photography Technology and Art at Southwest Petroleum University serves as a photography course within the framework of higher education aesthetic education, bearing the multifaceted mission of cultivating students' aesthetic capabilities, artistic literacy, and technical competencies. By embedding intelligent technologies throughout the entire pedagogical process of "learning-teaching-management-evaluation" in higher education photography instruction, this initiative fundamentally transforms the philosophy, methods, content, structure, and modalities of aesthetic education in universities. Through intelligent technologies, it advances personalized instruction in higher education photography courses, propels the digital transformation of education into new domains, and drives a cognitive revolution through digitalization to achieve leapfrog development in the instruction of aesthetic education courses.

2. Exploring Intelligent Technology-Empowered Innovation in University Aesthetic Education

The teaching team of the course Digital Photography Technology and Art at Southwest Petroleum University, themed on "Exploring the Integration of Intelligent Technology and Aesthetic Education Courses," has constructed a new-generation "M + LIF" instruction model to achieve systematization of teaching resources, precision of instructional interaction, and competency-oriented evalua-

tion. The team explores innovative applications of intelligent agents in photography education and establishes the AIRVC (Analysis, Intelligent editing, Resources, Virtual photographer, Creative inspiration) framework for AI-agent photography instruction, integrating high-quality digital photography art resources. By constructing a “virtual-real integration” pedagogical scenario, the team develops an intelligent course platform online, incorporating functions such as AI-powered Q&A and peer critique of student work to support cross-regional cloud-based teaching and research among faculty and students. Offline, an immersive digital photography instruction system is built leveraging VR panoramic technology. Through “digitalization plus intelligentization” approaches, the team empowers high-quality development of university art courses and constructs a smart instructional system to enhance students’ learning capabilities.

2.1. Constructing a New-Generation “M + LIF” ICT-Integrated Instructional Model

Informatized teaching has evolved from the early stage of computer-assisted instruction to a new era marked by the deep coupling of information technology and disciplinary teaching [4]. This “deep coupling” encompasses three progressive dimensions: the construction of an informatized teaching environment, the realization of innovative teaching and learning models, and ultimately, the transformation of traditional classroom instructional structures. Grounded in this deep integration framework, the course team has systematically proposed targeted solutions and developed the “M + LIF” informatized teaching model (as shown in **Figure 1**). Aimed at comprehensively improving the quality of online teaching in the new era, this model explores a new instructional paradigm featuring multi-dimensional coordination and quality-equivalent guarantee.

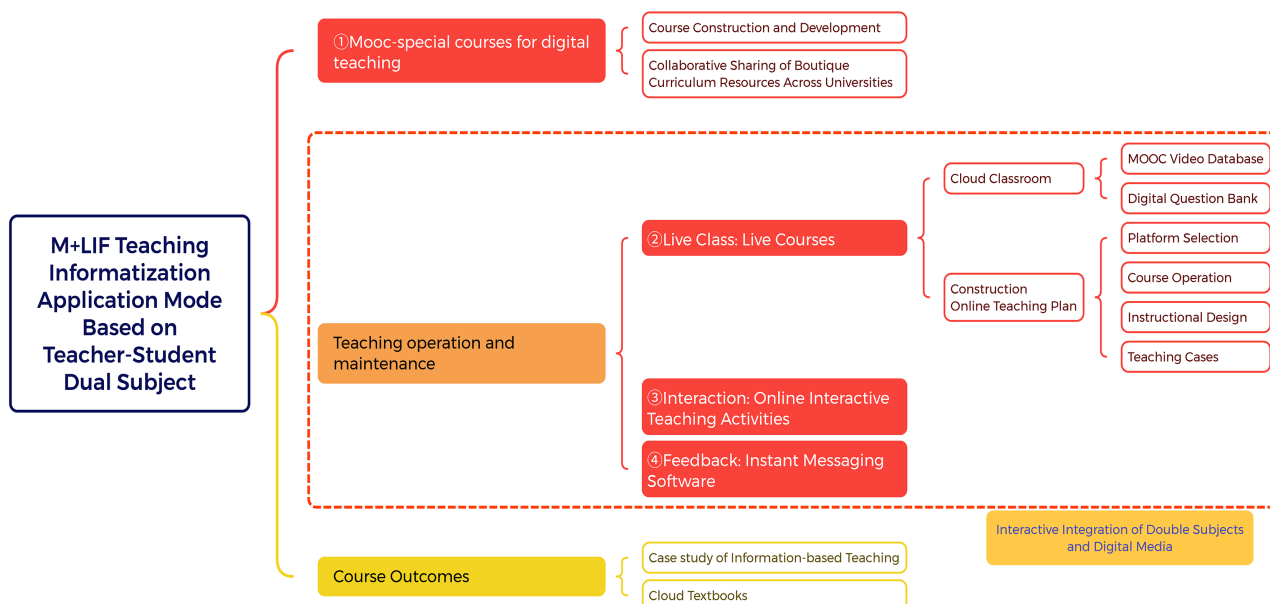


Figure 1. Construction diagram of the “M + LIF” informational teaching model.

“M” refers to MOOC (Massive Open Online Course). In accordance with the characteristics of the blended teaching model, instructional design is carried out to scientifically divide the curriculum into online video-based learning and in-class instruction. Micro-teaching videos are developed to realize the integrated linkage among online self-study, in-class discussion, and after-class extension. High-quality instructional resources are constructed to support teachers’ teaching, students’ autonomous learning and self-management, and to meet the requirements of mobile teaching.

“L” stands for Live class, namely live-streaming instruction. Targeted live-streaming teaching is delivered in light of collected students’ learning intentions, and subversive live-streaming instruction is conducted, focusing on insufficiently covered knowledge points in online course content. Online information transmission and offline information internalization complement each other to form an integrated whole, which truly centers on students as the main body and motivates their initiative in autonomous learning.

“I” refers to Interaction, which stands for interactions between teachers and students as well as among students. Mobile learning tools are employed to support the construction of an interactive online education platform, featuring in-class discussion zones, web seminars, and photo-based check-in activities. Authentic cases closely related to learners’ daily experiences are adopted to stimulate active learning. Real-time communication, questioning, and responding between teachers and students are conducted on the platform, enabling the in-depth application of interactive approaches, activating learners’ thinking, and arousing their learning interest.

“F” refers to Feedback, representing the online teaching feedback mechanism. It provides channels for teacher-student communication and feedback, enabling timely monitoring of learners’ learning progress and responses to their learning needs. Questionnaires are regularly distributed to conduct satisfaction surveys, collecting learners’ comments and suggestions, so as to adjust the course schedule or teaching content in light of learners’ actual learning conditions.

The teaching model of the aesthetic education course Digital Photography Technology and Art has been optimized and adjusted using the “M + LIF” model. Its effectiveness, feasibility, and validity are verified through practical teaching applications. The experiences and achievements are summarized and disseminated to promote the efficiency of online aesthetic education teaching in universities and improve the quality of online aesthetic education courses.

2.2. Constructing the AIRVC Framework for AI-Agent Photography Instruction

During the teaching of the course Digital Photography Technology and Art, the innovative application of intelligent agents in photography education is explored, and a personalized photography teaching model based on intelligent agents is designed and implemented. This study analyzes the current teaching methods, re-

source allocation, and challenges in photography education. By making full use of photographic image recognition technology, the AIRVC framework for agent-based photography teaching applications (as shown in **Figure 2**) is constructed, and an AI agent capable of understanding photographic works and delivering professional evaluations is developed, so as to effectively promote the improvement of photography education and teaching.

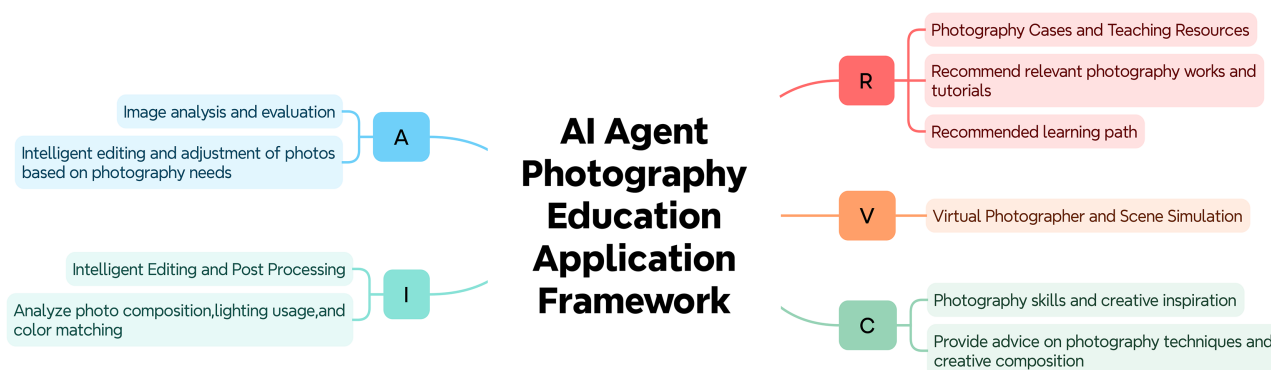


Figure 2. AIRVC application framework for photography education.

“A” stands for Analysis and evaluation of images. The intelligent agent analyzes key elements of photographs, such as composition, lighting application, and color matching, and provides feedback on photographic quality, artistic value, and technical guidance. This helps learners identify strengths and areas for improvement in their works and offers targeted instruction to enhance their photographic skills.

“I” refers to intelligent editing and post-processing. Photos are intelligently edited and adjusted according to photographers’ needs. Parameters such as exposure, contrast, and color balance are automatically optimized in line with individual styles and preferences, accompanied by optimal post-processing recommendations. This enables learners to quickly grasp the effects of various post-processing techniques and better understand how to improve their photographic works.

“R” stands for Resources of photography case studies and teaching. Relying on intelligent agents, a large number of photography cases and teaching resources are collected and organized to provide learners with study materials and references. In accordance with learners’ interests and demands, relevant photographic works, tutorials, and learning pathways are recommended, enabling learners to acquire photographic knowledge and skills in a more systematic manner.

“V” refers to a virtual photographer and scene simulation. Intelligent agents are employed to simulate diverse photographic scenes and lighting conditions. Through interaction with the virtual photographer (AI photography learning companion), learners gain insights into the application of photographic techniques across different environments. By conducting hands-on operations and practices within a virtual photographic environment, learners enhance their practical competence and creative ability. Such a virtual practice environment effectively improves students’

learning efficiency and practical skills.

“C” refers to creative inspiration and photography skills. The intelligent agent provides recommendations on photographic techniques and creative composition. By analyzing a large number of photographic and artistic works, it offers inspiration and guidance regarding composition, subject selection, shooting angles, lighting application, and other key aspects. This is particularly beneficial for beginners, as they can draw on the experience of professional photographers and artists.

2.3. Constructing a Personalized Knowledge Graph for Photography Instruction

A personalized knowledge graph for photography teaching is constructed, weaving fragmented photographic knowledge into an intelligent network through AI technologies, so that each learner is provided with a customized learning pathway. In accordance with learners' proficiency levels, interests, and learning objectives, learning pathways and resources are intelligently recommended [5]. This realizes the structured and visualized representation of photographic knowledge and improves teaching efficiency as well as the overall learning experience.

The personalized knowledge graph for photography teaching weaves originally scattered knowledge points—such as aperture, shutter speed, color theory, and composition—into an intelligent map that supports querying, reasoning, and continuous evolution. The personalized knowledge graph is constructed through a three-step workflow: knowledge extraction, relational modeling, and dynamic updating. Core photographic concepts are extracted from the course syllabus and case libraries; inter-node relationships are defined according to cognitive logic; and the graph is iteratively refined based on incoming learner data.

The graph comprises five core node types: knowledge nodes (e.g., aperture, composition, color theory), skill nodes (e.g., portrait lighting, landscape composition), resource nodes (e.g., micro-lectures, VR scenarios, quizzes), work nodes (student submissions and AI analysis results), and learner nodes (individual profiles). Semantic associations are established through edges representing prerequisite knowledge, mastery level, and interest relevance.

Learner data are drawn from three sources: platform behavioral data (video viewing duration, quiz scores), AI-powered work analysis data (composition and exposure ratings), and interactive interest data (AI dialogue topics, check-in activity selections). These inputs collectively generate dynamic learner profiles.

The recommendation engine operates on three rules: 1) Gap-priority rule: when prerequisite knowledge mastery falls below a predefined threshold, the corresponding micro-lecture is prioritized; 2) Error-tracing rule: when a specific dimension of a submitted work receives a low score, the system backtracks to identify weak knowledge nodes and recommends targeted exercises; 3) Interest-alignment rule: when multiple nodes at the same level satisfy learning conditions, the system prioritizes resources aligned with the learner's stated interests.

Classroom example. A student submitted a night portrait photograph. AI analysis indicated underexposure and poor background blur. Tracing backward from the work node through the skill node to the knowledge node, the system identified that the student’s mastery of “large-aperture application” and “ISO control” was 45% and 38%, respectively—both below the threshold. The system then automatically pushed a micro-lecture on night-portrait exposure techniques and a VR simulation exercise on large-aperture bokeh, while also recommending urban nightscape case studies matching the learner’s interest tag, thereby achieving precise remediation.

2.4. Designing an AI-Empowered Personalized Instructional Model for Photography Education

Based on the established AIRVC application framework for photography education, this study designs an AI-agent “empowerment” human-machine collaborative instructional model (as illustrated in **Figure 3**). Through an integrated five-dimensional approach—encompassing knowledge graph construction and application, online personalized tutoring and interaction by AI instructors, offline auxiliary instruction by AI instructors, photography course design, and classroom teaching—this AI-agent-based personalized photography instructional model provides learners with tailored photography learning experiences. Through the guidance and instruction of intelligent agents, learners are assisted in mastering photography techniques and enhancing their photographic proficiency.

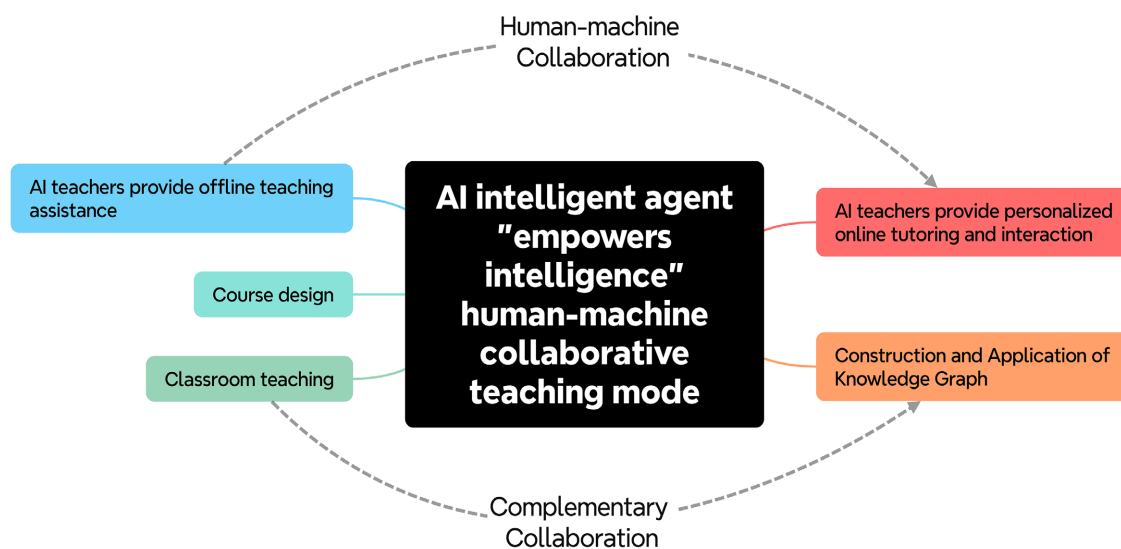


Figure 3. AI-agent “empowerment” human-machine collaborative instructional model.

2.4.1. Intelligent Agent Role Setting

Design a role for an “AI photography mentor” who has extensive photography knowledge and experience, and who can interact with and guide learners. Intelligent agents can have a personalized tone and style to increase learners’ interest and engagement.

2.4.2. Personalized Learning Path Recommendation

AI “empowers” learners with personalized learning paths and teaching content based on their photography skills and interests. Learners can choose topics or technologies that interest them through conversations with intelligent agents.

2.4.3. Real-Time Guidance and Feedback

Provide real-time guidance and feedback based on the learner’s shooting situation. By analyzing learners’ photos, the intelligent agent can identify problems in the shooting process and provide suggestions for improvement.

2.4.4. Interactive Learning Experience

Learners engage in interactive dialogue with intelligent agents, answer learners’ questions, and share photography skills and experiences. Intelligent agents can also provide instance photos and case analyses to help learners understand and apply the knowledge they have learned.

2.4.5. Intelligent Agent Optimization and Updating

Intelligent agents can provide more accurate and personalized guidance and advice through continuous learning and optimization. Intelligent agents can continuously update and expand teaching content based on learners’ feedback and needs.

By designing and implementing a personalized photography teaching model based on intelligent agents, learners can obtain more targeted and personalized photography teaching experiences and enhance their photography skills and creative abilities.

3. Instructional Practice of University Aesthetic Education Empowered by Intelligent Technologies

3.1. Digital Development of Course Content

Based on the intelligent technology-enabled “M + LIF” information-oriented teaching model, aesthetic education MOOC content aligned with course objectives has been developed. The course has been launched simultaneously and offered publicly on the China University MOOC platform and Xueyin Online platform. By December 2025, the course had been delivered for a total of 18 complete teaching cycles. Digital teaching resources have been produced and continuously updated, and digital integration has been implemented for teaching courseware, micro-videos, audio materials, online quizzes, teacher-student discussion forums, assignments and examinations, online question banks, and other resources. An intelligent teaching support system featuring intelligent recommendation and diversified learning assessment has been designed, together with mechanisms to encourage students to actively participate in online learning and discussions and obtain incentives for engagement. These measures ensure that teaching content keeps pace with the times and that students continuously acquire new knowledge and achieve academic expansion.

3.2. Instructional Implementation and Process Management

This study adopted a quasi-experimental design. The local undergraduate class on campus served as the experimental group, implementing an intelligent-agent-based information-based teaching model, while the remote class from partner institutions and the open-access online class for public users constituted the control group, employing traditional instructional approaches. Data were collected through mixed methods to compare learning outcomes between the two groups. The course was delivered via the Xueyin Online and China University MOOC platforms. During the study period, 763 valid questionnaires were collected, covering all three learner groups. Data were drawn from three sources: 1) online questionnaire data, encompassing dimensions such as learning satisfaction, learning interest, self-efficacy, and learning experience; 2) platform learning-record data, including course scores, pass rates, dropout rates, video viewing duration, quiz scores, and discussion forum behaviors, extracted from the backend databases of Xueyin Online and China University MOOC; and 3) AI work-analysis data, in which the image analysis module of the AIRVC framework automatically scored student-submitted photographic works and annotated skill dimensions.

Regarding ethics and informed consent, this study followed the data-use regulations for online open courses in higher education. All learners were informed at platform registration that course data might be used for teaching research and consented to the anonymized collection of platform learning-behavior data. The online questionnaire stated the research purpose, voluntary participation principle, and anonymity and confidentiality measures on its front page; submission of the questionnaire was considered informed consent. Research data were used solely for course improvement and teaching research, with no disclosure of personal or private information involved.

Relying on the AIRVC framework for photography teaching, the informatized photography classroom has been reshaped, enabling real-time monitoring of teaching progress and student engagement. Breaking away from traditional teaching models and advancing classroom teaching reform, modern pedagogical approaches are adopted to foster students' all-round development in cognition, literacy, and aesthetic ability. The interactive advantages of information technology are fully leveraged to stimulate interactions between teachers and students as well as among students. The strengths of internet technology, mobile teaching applications, live-streaming instruction, and other information technologies are deeply integrated into the teaching process. Mobile applications are used to share creators' shooting concepts and techniques, flattening communication among participants. Students post their works to discussion forums, and interactive activities such as Top 10 voting for thematic photography and excellent work sharing are carried out. Both students and instructors comment on and like assignments, which effectively enhances students' sense of satisfaction and achievement. The social interactive learning platform allows students to share and communicate with a wider audience, greatly breaking the spatial limitations of traditional class-

rooms.

Leveraging the AI-agent “empowerment” human-machine collaborative instructional model, with personalized learning as the focal point and student-centeredness as the guiding principle, this approach achieves dynamic aggregation of digital educational resources. Centered on students, it develops distinctive resources and promotes the construction and integration of high-quality digital resources to realize qualitative evolution and enhancement of digital educational resources. Through technological innovation, it constructs an intelligent course instruction platform. Empowered by digital intelligence, it facilitates high-quality development of first-class course platforms, innovates the instruction ecosystem, and promotes deep integration of aesthetic education course instruction with informatization. Through integration-facilitated instruction, it builds intelligent instructional environments and software. Through practical actions, it explores new pathways and methods for integrating digital intelligence with higher education instruction, promoting the transformation of aesthetic education course instruction under information technology.

3.3. Development of VR-Based Digital Photography Instructional Resources

A smart photography classroom is constructed based on VR panoramic technology, accompanied by the development and production of digital photography teaching resources underpinned by the same technology. An immersive digital photography teaching system is established to explore the deep integration and application of virtual reality technology in education and teaching. By applying VR panoramic technology, photographic works from various scenarios are transformed into panoramic images or videos, enabling students to observe and explore freely within the virtual environment. The immersive learning approach helps students better comprehend the principles of photographic technology and artistic creation, while improving their observation, aesthetic competence, and creative ability.

Through the development of VR-based digital photography instructional resources, diverse and enriched teaching content is created, encompassing various genres such as landscape photography, portrait photography, and still-life photography. Students can utilize virtual reality devices and platforms to comprehensively learn a wide range of photographic techniques and compositional methods in an immersive context, as well as appreciate photographic works with diverse regional and cultural backgrounds.

3.4. Learning Assessment and Feedback

Relying on online communication tools to establish teacher–student interaction channels, an instant feedback mechanism is constructed to monitor learners’ learning progress in a timely manner and respond to their learning needs. Satisfaction surveys are conducted periodically to collect learners’ comments and sug-

gestions, and the course schedule or teaching content is adjusted according to learners' actual performance. Continuous assessment of students' learning processes is carried out through intelligent agents. Feedback from students and instructors is collected via online questionnaires and in-class comment sections to support iterative improvement of teaching.

A diversified learning evaluation system is constructed, giving equal emphasis to process evaluation and formative evaluation. During course implementation, activities such as photo-based check-ins are adopted to encourage students in photographic creation. Outstanding works are selected after each session's check-in, and upon completion of the course, excellent works are chosen through student voting, compiled into a photo desk calendar, and presented to the creators. The assessment of practical hands-on abilities is used to expand the depth of course learning.

4. Teaching Effect of Aesthetic Education Courses in Universities Based on Intelligent Technology

Leveraging the Xueyin Online and China University MOOC platforms, the course was offered to three distinct learner groups: undergraduate students from the host institution, undergraduate students from partner institutions, and general public users. Correspondingly, local instruction classes, remote instruction classes, and online instruction classes were established. The local undergraduate classes served as the experimental group, while the remote classes from partner institutions and the online classes for public users constituted the control group. The experimental group implemented an intelligent agent-based course instructional model, whereas the control group adopted traditional instructional approaches, thereby constituting two distinct operational and maintenance modalities.

4.1. Teaching Effectiveness Research Methods

Through online questionnaire surveys, the course team distributed questionnaires to all learner groups, collecting 763 valid responses. Empirical research indicates that students in the experimental group achieved significant progress, with substantially superior performance in photography learning compared to control group students using generic prompts. The testing and practice content for experimental group students varied considerably, demonstrating prominent personalized characteristics. Knowledge and skills acquired through practice could be transferred to the resolution of novel problems.

Analysis of the questionnaires reveals that students generally provided positive evaluations of this course and believed that participation would yield significant learning outcomes. Participating social learners came from diverse disciplinary backgrounds, including sciences, engineering, and humanities, ensuring high diversity and representativeness in the feedback received, thereby guaranteeing the objectivity and authenticity of the evaluation results. Students' positive evaluations reflect the broad applicability and educational value of this course across

different disciplinary contexts.

4.2. Analysis Results of the Teaching Effectiveness Questionnaire

Based on questionnaire analysis, the instructional practice of aesthetic education courses empowered by intelligent technologies demonstrates favorable outcomes, with both online instructional efficiency and student learning efficiency showing positive trends. Comparison with student performance from previous offerings without online instruction revealed an average score increase of 5.14 points in this course. Students generally accepted and expressed satisfaction with their learning efficiency and outcomes. Specifically, 87.63% of students reported that pushed personalized learning resources enhanced their learning interest; 88.51% believed that their photography knowledge acquisition capabilities and practical photography skills improved significantly through the intervention of intelligent technologies, including AI, knowledge graphs, and intelligent agents; 96.57% considered the updated assessment mechanism more scientific and rational; and 23.66% indicated that grade prediction alerts helped them avoid course failure. The learning efficiency of this course demonstrates distinct advantages.

4.2.1. A Significant Improvement in Personalized Learning Competence

Compared with traditional classroom learning, intelligent agent-based instructional methods can more intuitively, comprehensively, and authentically reflect learners' learning characteristics and learning styles. This "thousand-person, thousand-face" online teaching approach undoubtedly provides greater opportunities for personalized learning. By understanding students' learning needs and interests, instructional resources and learning activities aligned with student characteristics can be provided to satisfy their personalized learning requirements. Such personalized learning can improve students' learning interest and learning effectiveness.

4.2.2. A Greater Diversity of Teaching Resources

Based on in-depth analysis of user data that is subsequently fed back into instruction, online courses provide diversified and multimodal instructional resources. Such diversity can offer richer learning experiences, assisting students in better understanding and mastering knowledge. Meanwhile, different forms of instructional resources can accommodate students' varied learning styles and preferences, thereby enhancing learning effectiveness.

4.2.3. The Improvement of Interactivity and Cooperative Learning Abilities

Various forms of interactive and collaborative learning approaches facilitate communication and interaction among students. Based on findings from behavioral data analysis, learning tasks and activities are rationally designed to enable students' full participation and hands-on practice. More appropriately designed learning tasks and activities promote students' active learning, improving their thinking capabilities, creativity, and collaborative awareness.

4.2.4. A Significant Reduction in the Dropout Rate of Online Teaching

As an open online course, the majority of learners are social learners or undergraduate students from other higher education institutions. In previous instructional practices, this course more or less experienced “mid-course online dropout” phenomena, with the proportion of students who ultimately passed course assessments and obtained credit certificates being relatively low, approximately 41.3%. However, after these two instructional cycles, the learner assessment pass rate increased to 63.9%, the mid-course online dropout rate decreased by approximately 19.39%, and students demonstrated favorable responses to intervention measures such as personalized instructional resource pushing and instructor-student interactive teaching. The proportion of learner groups who successfully passed course assessments and obtained credit certificates increased markedly.

The overall results demonstrate that students’ comprehensive course ratings exceeded 4.7 out of 5 points, indicating a high level of student satisfaction. Among social learners, the course also attracted participants from professional backgrounds, including photography and journalism. Over 98% of learners reported that the course enabled them to effectively acquire photographic knowledge, enhance their photographic skills, and improve their artistic aesthetic literacy.

5. Teaching Achievements of Aesthetic Education Courses in Universities Based on Intelligent Technologies

Relying on the course, this study explores the reform and innovation of aesthetic education teaching from the perspective of intelligent technology, yielding fruitful results. Numerous process-oriented research outcomes produced in the course of teaching practice have earned various awards and distinctions, including:

One of the Top Ten Typical Cases in Higher Education among Application Cases of the National Smart Education Platform;

High-quality curriculum resources in Sichuan Province’s Smart Elderly Support program;

First Prize in the Information-Based Teaching Course Competition (Higher Education Group) of Sichuan Provincial Teachers’ Information Literacy Improvement Practice;

Typical Work in the National Teachers and Students Information Literacy Improvement Practice;

Third Prize in the First Sichuan Provincial Teachers’ Artificial Intelligence Application Ability Competition.

Excellent case of the “University-Enterprise Cooperation Double Hundred Program” by the China Higher Education Association;

Excellent Smart Education Case for Regular Undergraduate Universities in the Chengdu-Chongqing Economic Circle.

First Prize in the National College Teachers’ Teaching Innovation Competition;

Second Prize in the Classroom Teaching Innovation Competition of Southwest Petroleum University;

First Prize in the Teaching Achievement Award of Southwest Petroleum Uni-

versity.

In addition, the course Digital Photography Technology and Art has been successfully selected as a Provincial First-Class Online Course in Sichuan Province.

These teaching achievements have been exhibited at the China Higher Education Expo and shared with peers from universities nationwide at relevant conferences, demonstrating significant application effects and extensive influence.

6. Conclusions and Future Prospects

Taking the course Digital Photography Technology and Art at Southwest Petroleum University as a practical carrier, this study centers on the core goal of intelligent technology empowering innovative information-based teaching in college aesthetic education. It deeply integrates technologies including artificial intelligence, virtual simulation, knowledge graph, and intelligent agents into the whole process of “learning-teaching-management-assessment” in photography courses. The research constructs an “M + LIF” information-based teaching model, an AIRVC intelligent agent teaching framework, a personalized knowledge graph for photography teaching, and an “intelligence-enabled” human-machine collaborative teaching system, forming an implementable, replicable, and generalizable intelligent solution for aesthetic education teaching.

Practical results show that this model effectively addresses the pain points of traditional aesthetic education courses, such as single resources, outdated methods, insufficient personalization, and weak interaction. It significantly improves students’ personalized learning ability, artistic aesthetic literacy, and practical creation competence, reduces dropout rates in online teaching, and enhances teaching efficiency and quality. This provides a typical paradigm and practical experience for the digital transformation of aesthetic education in colleges and universities.

Against the future trend of deep integration between educational digitalization and intelligent technologies, this study still leaves room for further expansion and optimization. Future work will be continuously advanced in the following three aspects:

Deepening the application of large models and intelligent agents, next-generation generative artificial intelligence will be introduced to optimize the interactive capabilities of the AI photography tutor, enabling multimodal tutoring, creative generation, artwork diagnosis, and precise adaptation to personalized learning paths, thereby enhancing the intelligence and immersion of human-machine collaborative teaching [6].

Expanding virtual-real integrated teaching scenarios, the VR panoramic photography teaching system will be improved to enrich virtual shooting scenarios, lighting environments, and creative tasks. An immersive, whole-process practical teaching closed loop covering pre-class, in-class, and post-class stages will be constructed to strengthen the cultivation of aesthetic experience and hands-on abilities.

Promoting outcome dissemination and ecological co-construction, mature models and high-quality resources will be opened and shared with more college aesthetic education courses and social aesthetic education platforms. Cross-university and cross-regional collaborative research mechanisms will be refined to continuously expand the demonstration effect and scope of influence, supporting the digital transformation of higher education and the high-quality development of college aesthetic education in the new era.

Funding

This research is supported by the 2024 Educational Informatization Research Project of the Sichuan Higher Education Association, titled “Exploration and Research on AIGC-Enabled Smart Teaching in Higher Education from the Perspective of Educational Metaverse” (Project No. 11).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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