Reshaping the Future: The Tansformation of Museum Vocational Education Enabled by Artificial Intelligence

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Abstract

As artificial-intelligence technologies penetrate every facet of cultural-heritage preservation and dissemination, museums are redefining not only their public identity but also the very structure of the professional education that sustains them. At the vocational-education level, the urgent question is how to integrate AI tools organically with the knowledge domains of museum-related occupations. Focusing on the reshaping of museum vocational education, this paper proposes a future-oriented training framework anchored in four dimensions—creative education, technical practicum, competency cultivation, and systems design—and demonstrates its feasibility.

Keywords: artificial intelligence; digital curation; technical practicum; museum vocational education; museum-school collaborative training

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[1] This work is one phase of the key research project "Design and Implementation of an Artificial-Intelligence-Based Personalized Museum Visitor Experience System" (Grant No. SCWW2023A04), funded by the Sichuan Provincial Cultural Heritage Bureau.

Introduction

In the 21st century, museums have long transcended their traditional roles as static exhibition halls and repositories of knowledge, evolving into hybrid spaces that integrate technology, education, and cultural experience. Against this backdrop, artificial intelligence is infiltrating every layer of museum operations at unprecedented speed—from exhibition curation to visitor interaction, from digital asset management to intelligent guide systems—demonstrating AI's transformative power. As the primary pipeline for cultivating future museum professionals, vocational education must urgently update its content, objectives, and competency standards to keep pace. This paper responds to that imperative by constructing a museum vocational-education pathway aligned with the intelligent era.

1. Creativity-Oriented Reconstruction of Museum Education: GenAI-Driven Pedagogical Innovation

In conventional programmes, students mainly receive knowledge passively, with few opportunities for active participation or creation. The introduction of Generative AI (GenAI) disrupts this pattern. GenAI can assist learners in producing images, texts, and even audio, enabling "learning through play" and "thinking through creation." For example, a course may assign a digital-painting project inspired by museum collections; under AI assistance students generate artworks while consulting historical sources and articulating creative ideas, thereby activating deep and enthusiastic learning.

This approach not only enhances students' expressive and design capabilities but also trains them to deploy AI tools when solving concrete problems, reinforcing the fusion of technology and content. More importantly, interacting with technology fosters an understanding of AI's role as a cultural intermediary. Grasping these "content-creation mechanisms" is an indispensable literacy for future digital posts in museums. Thus, creativity-oriented instruction is not merely a methodological update; it restructures the competency profile and paves the way for the technical practicum discussed below.

Moreover, the model drives innovation in instructional organisation. Traditional courses rely heavily on lectures and classroom discussion, lacking situational or task-based drivers. Leveraging GenAI, teaching can shift to project-, task-, and collaboration-centred formats. Students assume authentic roles such as “curator,” “content editor,” or “virtual docent,” gaining realistic job previews that heighten engagement and immersion while informing future career choices.

GenAI also transforms the teacher’s role. Instructors cease to be mere knowledge transmitters; they become task designers, process facilitators, and feedback providers. In creative settings teachers must integrate across disciplines, crafting assignments that combine museology, AI, design, and language, and guiding inquiry-based learning. In a “design a virtual exhibition” task, for instance, teachers coach students in topic selection, research, AI-assisted generation of artefacts and interpretive texts, and final project defence.

This pedagogical shift deepens student learning while upgrading faculty expertise, thereby restructuring university – museum joint training mechanisms. Course-assessment models must evolve correspondingly, moving beyond summative grading to process-oriented, multi-dimensional evaluation that covers creative quality, teamwork, problem-solving, and AI-tool proficiency — metrics that mirror industry needs and foster continuous course improvement.

2. Technology-Driven Competency Building: Integrating Deep Learning with Intelligent Museum Operations

Moving from creative generation to technical practice constitutes the next logical phase of museum vocational education. Students progress beyond conceptual expression and visual creation to engage directly with AI system workflows, understanding algorithmic logic, functional architecture, and the advantages and constraints of museum-specific deployments.

Deep-learning technologies are now ubiquitous in museums. Typical cases include CNN-based collection-identification systems, semantic-driven artefact-narrative engines, and multimodal interactive virtual-guide platforms. These applications not only enhance visitor experience but also provide embeddable teaching modules. Students may, for example, train an image-classification model to recognise ancient Chinese bronzes, mastering data cleaning, feature extraction, and classification before deploying the model in a web-based collection-query system—experiencing the full pipeline from model construction to on-site application.

Intelligent operations also encompass broader data-driven decision-making. Museums collect large volumes of data from ticketing, security, visitor-flow sensors, and social-media interactions. Vocational programmes should introduce these real datasets into coursework so students can conduct live analytics. A sample assignment might ask learners to investigate “anomalous dwell time in a gallery zone,” using Python and AI tools to parse JSON log files, extract behavioural patterns, generate visual reports, and propose layout optimisations.

To meet the demand for hybrid digital roles, curricula must cultivate cross-platform integration and systems-deployment skills. Future posts often require simultaneous command of on-premise databases, cloud APIs, and mobile adaptations. Accordingly, courses should add systems-integration modules teaching students to embed AI SDKs for speech recognition, sentiment analysis, or automatic translation, enabling them to build prototypes such as “intelligent kiosks” or “visitor-behaviour trackers.”

Throughout, students learn not merely to operate tools but to grasp the architecture and logic of digital museum systems. They master the “data–model–interaction” flow and learn to compare and optimise technical solutions—competencies more critical than basic software proficiency and essential for long-term growth in tech-museum fusion roles.

Assessment in this technology-driven stage must likewise evolve. Traditional tests of memorised knowledge or standard operations are insufficient. A tripartite model—“system-architecture report + application demo + problem-retro log”—should evaluate theoretical design, project development, and maintenance, comprehensively reflecting technical mastery.

Teaching Module	Core Content	Targeted Competencies
Image Recognition & Annotation	Collection-image acquisition; AI classification-model training	Data handling; algorithmic comprehension
Data Analytics	Behaviour-log analysis; visitor-flow modelling	Data cleaning; data visualisation; logical reasoning
System Integration	API interfacing; platform construction; embedded-AI modules	System deployment; cross-platform collaboration
Virtual Guide Design	Virtual-scene construction; voice-interaction configuration	Spatial design; human – computer interaction; content-generation

Figure 1: Technology-competency-oriented AI practicum curriculum structure

Through this sequence of targeted instructional designs, the practicum is no longer a simple software session; it becomes a critical bridge that links creativity to application and integrates cognition with practice.

3. Competency-Centric Educational Elevation: Humanistic Reframing of Abilities

Although artificial-intelligence technologies continue to evolve, their embedding in education must not rely solely on technical novelty; it must be accompanied by deeper cultural guidance and value calibration. As repositories of cultural memory, museums have a vocational-education responsibility to foster students' cultural identity and social responsibility. In a rapidly changing, AI-saturated environment, value reflection rooted in the humanities is indispensable; without it, learning risks collapsing into an assemblage of hollow, instrumental skills incapable of sustaining the hybrid talents future society demands.

While cultivating students' AI application skills, equal emphasis must be placed on multi-dimensional competencies—namely aesthetic understanding, ethical awareness, critical thinking, and intercultural communication. Courses can host seminars on "the ethics of AI-mediated cultural display," prompting learners to debate the boundary between virtual exhibits and authentic artefacts and to interrogate digital reconstructions for cultural misreadings or identity biases. Close reading, role-play, and simulated visitor interviews are used to trigger deeper reflection on the relationship between cultural reproduction and technological mediation.

Future museum professionals must not only operate systems skilfully; they must interpret cultural phenomena across diverse contexts, articulate narrative logics, and curate emotionally resonant exhibitions. Thus, the curriculum incorporates narrative- and context-based, task-driven activities. In a project titled “memory politics in digital curation,” for example, students design an exhibition framework around a historical event, selecting artefacts, writing labels, and constructing interactive pathways while evaluating whether AI assistance enhances cultural empathy or reinforces stereotypes. Such problem-based tasks sharpen critical thinking and deepen expressive sophistication.

Faculty development is equally critical. An interdisciplinary, cross-sector teaching team should be formed—philosophers, communication scholars, and psychologists co-design and co-deliver courses alongside AI engineers and museum professionals. This pluralistic lens enriches the intellectual density of the curriculum and sustains students’ motivation to explore complexity.

To reinforce these outcomes, a competency-oriented assessment system is introduced. Moving beyond quantitative scoring, it foregrounds growth processes and evolving reflective capacity. Learning journals, self-statements, peer reviews, and open-ended interviews create a multi-actor, multi-dimensional feedback loop, enabling students to craft deeper professional identities through articulation, negotiation, and identity construction.

Amid accelerating digitisation, a human-centred educational philosophy offers a vital counterbalance to technological exuberance and signals education’s long-term strategic commitment to value formation. Systematically embedding competency training within vocational structures is a decisive step toward a mature educational ecology rooted in cultural consciousness.

4. Integrated Architecture for Educational Innovation: Aligning Instruction, Practicum, and Assessment

Systemic reform of museum vocational education hinges on an integrated architecture that accommodates diverse roles and functions. This architecture must ensure coherence at the curricular level and continuity in implementation, enabling the three core components—instruction, practicum, and assessment—to interlock and mutually reinforce one another.

Functional Module	Description	Stakeholders
Teaching Resource Pool	Instructors upload course materials, case libraries, instructional videos, etc.	Teachers, content curators
Practicum Studio	Students submit tasks and complete simulation projects	Students, project mentors
Competency Evaluation System	AI analyses learning pathways and provides stage-by-stage feedback	System, teachers
Museum-School Interface	Hosts industry projects, opens practice posts, and connects data platforms	Enterprises, museums, schools

Figure 2: Functional architecture of the intelligent collaborative education platform

First, at the instructional level, course content must transcend disciplinary silos and adopt a cross-boundary, modular architecture. Specifically, sub-modules such as “Intelligent Collection Management,” “Digital Curation Logic,” “AI Human–Computer Interaction Design,” and “Virtual Guide Technology Application” can be created to dismantle the traditional compartmentalisation of subjects. Students thereby accumulate knowledge within a coherent system and achieve transferable competencies. Project-based tasks organically link these modules and converge into a portfolio of immediately applicable vocational skills. This job-profile-oriented curriculum enhances both the adaptability and flexibility of the educational supply side.

Second, in organising practicum experiences, authenticity of scenario construction and complexity of task design must be prioritised. Simple, operation-level drills no longer meet AI-era demands for hybrid talent; they should be replaced by a "task-cluster + role-based" training paradigm. For instance, a simulated museum data-middle-platform environment can be built in which students rotate through roles such as collection-data engineer, user-experience analyst, and interactive-curation consultant to complete the full workflow from data governance to exhibition optimisation. This method not only hones technical and coordination skills but also cultivates decision-making awareness and project-management literacy within context.

Third, the assessment mechanism should gradually introduce a dual-track system of "dynamic monitoring + intelligent feedback," enabling real-time observation and deep intervention throughout the learning process. By deploying learning-behaviour tracking tools and AI analytics interfaces, micro-level performance across platform operation, copy-writing, and project collaboration can be recorded in real time. Learning-path preferences and task-completion cycles are then synthesised into individual growth profiles. Such data provide teachers with precise guidance and help students identify blind spots, thereby strengthening goal orientation and self-regulation.

Building a unified platform is also a critical step toward instructional synergy. The platform serves as a resource hub, a task-flow centre, and a process-recording carrier. Its functions should span open resources, interactive feedback, outcome display, and competency assessment, while interfacing with digital-museum business systems to create a dynamic "learning-by-doing" loop. Platform design must balance technical scalability with user-experience usability, ensuring that stakeholders with diverse backgrounds can complete learning and management tasks efficiently.

The establishment of a museum – university co-development and co-cultivation mechanism is an indispensable layer of the system architecture. Museums and higher-education institutions should be encouraged to jointly develop blended online/offline courses and to run periodic “real-project-driven practicum weeks” or “industry-expert-in-the-classroom” initiatives, dismantling resource barriers among education, industry, and the museum sector. By co-building experimental bases, sharing job platforms, and co-researching development standards, talent-supply and demand matching can be refined, enhancing the openness and synergy of the education system.

Deep educational reform does not arise from the isolated leap of any single element; it depends on the integrated momentum of multiple dimensions. From conceptual renewal to technological embedding, from curricular restructuring to institutional reinvention, every link requires systemic thinking. The intervention of artificial intelligence has not eroded the cultural foundations of education; rather, it has expanded the practical boundaries of vocational education through pluralistic expression, precise coordination, and dynamic feedback.

At this historical juncture where old and new paradigms intersect, museum vocational education shoulders the responsibility of shaping the future talent landscape. Cultural reflexivity and technological sensitivity must advance side by side; instructional quality and application effectiveness must neither be neglected. Only by seeking flexibility within structure and infusing humanistic spirit into process can an educational system truly acquire the capacity to adapt to change and lead development.

Conclusion

Artificial intelligence is currently redrawing the boundaries of education and placing new demands on the museum workforce. Reconstructing the educational system is not a matter of replacing tools but involves a shift in philosophy and in mechanisms of coordination. Amid the interplay between cultural grounding and technological tension, museum vocational education urgently needs to establish a forward-looking and extensible pathway for competence building.

Looking ahead, integrated reform must be continuously advanced at the levels of policy, curriculum, and resource integration to create a transferable and sustainable pedagogical model. By building pluralistic platforms, linking industry resources, and introducing evaluative innovations, education can truly respond to social change and cultivate a new generation of museum professionals who combine technological acumen with humanistic commitment. Every technological revolution should return to the original purpose of education—endowing learners with capability, conviction, and critical thinking. Museums, as sites where culture and technology converge, provide precisely the broad stage and rich source of imagination for this endeavour.

References

Lin, W., & Hu, X. (2025). GenAI supported creative learning in digital museum education: A case study of maritime art painting creation. In CHI EA ’25 Extended Abstracts,1-8.https://doi.org/10.1145/3706599.3719910

Kiourexidou, M., & Stamou, S. (2025). Interactive heritage: The role of artificial intelligence in digital museums. Electronics, 14(9), 1884. https://doi.org/10.3390/electronics14091884

Wen, J., & Ma, B. (2024). Enhancing museum experience through deep learning and multimedia technology. Heliyon, 10(12), e32706. https://doi.org/10.1016/j.heliyon.2024.e32706

Derda, I., & Predescu, D. (2025). Towards human-centric AI in museums: Practitioners’ perspectives and technology acceptance of visitor-centred AI for value (co-)creation. Museum Management and Curatorship, 1–23. https://doi.org/10.1080/09647775.2025.2467703

Zhang, Z., & Liu, X. (2024). Development trends of museum theory in the new century. Fine Arts, (5), 10–21.

Ha, W., Fan, A., Li, M., Xiao, Y., Wang, Y., et al. (2022). From global to China: Collaborative innovation between society and schools. Journal of East China Normal University (Educational Sciences), 40(12), 110–126.

Xu, H. (2023). Content construction and implementation of contemporary Chinese museum education. Studies in Dialectics of Nature, 39(2), 132–137.

Zhang, Q., & Liu, J. (2023). The “Jilin model” of cultural resources and education system construction in vocational-education museums: Development history, value connotation, and innovative practice. Vocational and Technical Education, 44(36), 15–22.

Feng, N., & Zhou, C. (2022). Turning crisis into opportunity: Restoration and reshaping of museum educational functions. Southeast Culture, 2022(5), 161–168.

Zhang, X. (2021). Practical paths for aesthetic education in museums from the perspective of multiple intelligences. Museum, 25(1), 38–45.

Zhang, Y. (2017). Current status, problems, and countermeasures of cultural-heritage vocational education in China. Chinese Museum, (4), 42–48.

Ding, C. (2017). Expansion and extension: A new exploration of the educational functions of museums in China—Based on the perspective of lifelong education. Journal of Jiangsu University of Technology, 23(1), 83–87.

Li, W. (2020). A study on the derivative functions of museum vocational education. International Public Relations, (2), 281.

Wang, H. (2023). Research on the construction of an evaluation framework for museum–school collaborative education effects [Master's thesis, Jilin University].

Zhong, W. (2023). Research on the development and application of smart-museum resources in "Philosophy and Culture" teaching [Master's thesis, Guangzhou University].