

Integration of Digital Media in Dance Education: New Media as Catalysts for Educational Innovation

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ABSTRACT

With the advancement of new media and digital technologies, artificial intelligence (AI), big data, 5G communication, virtual reality (VR), and augmented reality (AR) are reshaping dance education by enabling personalized learning, immersive training, and interactive experiences. However, as an art form grounded in bodily perception and emotional expression, dance education still requires pedagogical guidance; excessive reliance on technology may lead to the alienation of embodied experience. This study proposes a “technology–culture–body” triadic interaction model, grounded in TPACK, media convergence theory, and affordance theory, to examine the integration mechanisms of technology, pedagogy, and disciplinary knowledge within the digital transformation of dance education. The research highlights the significance of cultural context and embodied experience, revealing that while new media platforms enhance learning motivation, facilitate resource sharing, and promote global dissemination, algorithmic systems may inadvertently reduce cultural diversity. The study provides a theoretical framework and practical reference for the digital transformation and innovation of dance education, proposing sustainable development strategies and future research directions to support its high-quality growth and cultural innovation.

1. Introduction

With the rapid advancement of digitalization and intelligent technologies, the internet and new media industries are undergoing profound transformations in content production, modes of dissemination, and user experience. Emerging technologies such as artificial intelligence (AI), big data analytics, 5G communication, and virtual and augmented reality (VR/AR) have not only accelerated innovation within the media sector but also introduced unprecedented opportunities for the field of education (Author, Year). Against this backdrop, digital transformation, educational innovation, and new media applications have become key drivers of progress in arts education.

In this context, *new media* refers to media forms based on internet technologies and digital communication platforms, encompassing social media, streaming services, online learning environments, and virtual interactive spaces. Its core features—including immediacy, interactivity, visualization, and user participation—shift information dissemination from one-way to multi-directional flows and from static to dynamic forms. Meanwhile, *educational innovation* emphasizes learner-centered pedagogies, personalized instruction, cross-media learning experiences, and open, shared educational resources, offering theoretical support for upgrading teaching models within digitally driven arts education. *Digital transformation* leverages AI, big data, cloud computing, and intelligent networking technologies to enable systematic reforms in the management, content production,

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and dissemination mechanisms of the education and cultural sectors.

In the field of dance education, the application of these technologies is reshaping traditional pedagogical models and learning experiences. VR and AR technologies can create immersive and interactive training environments, allowing learners to rehearse and perform in virtual stages beyond the constraints of time and space. AI- and data-driven online education platforms provide personalized course recommendations and real-time feedback, enabling differentiated instruction and dynamic optimization of learning outcomes. In addition, new media-based dissemination models—such as live streaming and short-form video—enhance learner motivation and facilitate the popularization and cultural transmission of dance arts. However, systematic research on the integration of emerging technologies such as AI and VR/AR in dance education remains limited. Notably, gaps persist in the analysis of innovative educational models, cross-media cultural communication, and the effectiveness of technology-integrated pedagogical practices.

Therefore, taking *digital transformation*, *new media*, and *educational innovation* as its core analytical dimensions, this study adopts an interdisciplinary perspective to investigate the mechanisms and developmental pathways through which AI, big data, 5G, and VR/AR technologies are applied within dance education and the media industry. It further examines their implications for pedagogical innovation, enhanced learner experience, and global cultural communication.

2. Theoretical Framework

This study constructs an analytical framework for the digital transformation of dance education from a multidimensional perspective that integrates educational technology and media convergence. First, drawing on Mishra and Koehler's (2006) TPACK framework (Technological Pedagogical Content Knowledge), dance educators engaging in digital instruction must integrate technological knowledge, pedagogical knowledge, and disciplinary knowledge of dance in order to preserve the essence and depth of arts education while pursuing innovation.

Second, informed by Jenkins' (2006) Convergence Culture theory, the interactive nature of the internet and new media transforms learners from passive receivers into active participants and co-creators of content. The dissemination of dance learning is no longer confined to the traditional classroom; instead, platforms such as short videos and live-streaming enable socially embedded and culturally co-constructed learning practices.

Third, based on Gibson's (1977) Affordance Theory, digital technologies are understood as media that provide specific possibilities for action. The technological applications adopted in dance education depend not only on the functional attributes of the tools themselves, but also on how teachers and learners perceive, interpret, and enact these affordances, thereby achieving a dynamic balance between virtual environments and embodied experience.

Finally, following Varela, Thompson, and Rosch's (1991) Embodied Cognition Theory, this study underscores that the core of dance education lies in bodily experience and perceptual interaction. Digital technologies should enhance bodily awareness and expression rather than replace embodied engagement.

Synthesizing these four theoretical perspectives, this article proposes a comprehensive framework that encompasses technological integration, media culture, and embodied cognition

to analyze the mechanisms by which the internet and new media foster innovation in dance education. This framework provides not only theoretical grounding for the research but also methodological guidance for subsequent case analyses and educational practices. It highlights that the educational value of digital media should not be understood solely through the lens of "instrumental effectiveness," but rather within the broader context of reconstructing the educational and cultural ecosystem.

Digitalization is not a simple matter of technological substitution; instead, it redefines the roles of teachers, modes of learning, and patterns of bodily perception. Accordingly, this study adopts a "technology-culture-body" tri-dimensional framework to examine how media technologies in dance education simultaneously enable pedagogical innovation while also posing potential risks of alienation.

3. Drivers of Innovation and the Popularization of Dance Arts Education

From the perspective of educational technology integration and informed by the TPACK framework (Mishra & Koehler, 2006), this chapter examines how dance education achieves coordinated integration of technology, pedagogy, and disciplinary knowledge within the context of digital transformation. The TPACK model provides a theoretical foundation for understanding the evolving role of teachers and the emergence of pedagogical innovation in media-rich learning environments.

In the global field of arts education, scholars widely emphasize that dance, as a distinctive form of bodily expression, is not only an essential medium of artistic creativity but also a significant contributor to learners' psychological development, cognitive growth, and positive shifts in social awareness. In recent years, international education policies have increasingly incorporated dance, drama, and film arts into basic education systems, reflecting the growing recognition of the value of arts education worldwide. This trend points to the diversification of educational objectives while signaling the advancement of aesthetic education toward more comprehensive and interdisciplinary directions.

Meanwhile, research in international performing arts and education consistently highlights technological advancement as a chief driver of innovation in artistic forms and modes of expression. From electrification to digitalization and now artificial intelligence, each technological revolution has profoundly influenced the expressive vocabulary, dissemination channels, and pedagogical models of the performing arts. In the era of artificial intelligence, AI not only provides innovative instructional tools and research methods for dance education but is also reshaping artistic creation, performance practices, and the development trajectory of related cultural industries.

Under the combined forces of digital transformation and new media, innovative models of dance education continue to emerge. AI- and big-data-driven online learning platforms can recommend personalized curricula and generate real-time feedback tailored to learners' interests and abilities, enabling dynamic optimization of learning outcomes. 5G communication technologies support ultra-high-definition streaming and multi-party real-time interaction, significantly enhancing learners' sense of immersion and participation. Virtual reality (VR) and augmented reality (AR) technologies create immersive and interactive training environments that allow learners to transcend spatial and temporal limitations, thereby enhancing their practical abilities and expressive performance. The integrated application of these technologies not only drives innovation in dance education but

also fosters cross-sector development between the arts education field and the digital media industry.

In higher arts education, leading international institutions are actively exploring interdisciplinary and cross-domain pedagogical models to cultivate talent with strong artistic foundations, creative capacities, and advanced digital and AI literacy. Such models enable students to develop critical thinking and innovative problem-solving abilities as they navigate between traditional and contemporary artistic practices. This shift aligns closely with the global digital economy, cultural industry transformation, and innovation-driven development strategies. Against this backdrop, dance education functions not only as a vital form of cultural heritage transmission but also as a key force in advancing emerging art–technology industries and sustaining innovation ecosystems.

4. Digital Transformation in New Media and the Background of Core Technological Applications

The core technologies underpinning new media platforms primarily include artificial intelligence (AI), big data, and 5G communication technologies. Their integration into the film and media industries has driven comprehensive upgrades in content production, modes of dissemination, and audience interaction.

4.1. Artificial Intelligence (AI)

Artificial intelligence has become a key force driving transformation in the film and media sectors. Artificial Intelligence (AI) refers to computational systems and algorithms that enable machines to simulate, extend, or partially replace human intelligence. It encompasses functions such as perception, learning, reasoning, decision-making, and creativity, allowing machines to perform complex tasks with minimal human intervention.

In content creation, AI algorithms facilitate automated video editing, visual effects generation, and scriptwriting assistance, thereby reducing production costs and expanding artistic possibilities. In distribution, machine-learning–based recommendation systems—such as those employed by Netflix and YouTube—enable personalized content delivery that significantly enhances viewer engagement. In post-production, AI is widely used for image restoration, color correction, automated dubbing, and real-time subtitle generation, increasing efficiency and artistic

precision. Moreover, applications of natural language processing help media content transcend linguistic barriers, strengthening global accessibility.

4.2. Big Data

Big data technologies provide robust analytic support for the film and media industry. Big Data refers to datasets that exceed traditional processing capabilities in terms of volume, velocity, variety, veracity, and value. Beyond sheer size, big data emphasizes efficient storage, processing, and analysis to identify patterns, forecast trends, and assist decision-making.

By collecting and analyzing large-scale audience data, platforms and production companies can identify audience preferences, predict consumption trends, and optimize investment decisions. Big data also enables targeted advertising and dynamic pricing strategies, improving the efficiency of revenue models. At the creative level, sentiment analysis and audience feedback provide empirical reference points for narrative structure and character development, allowing works to align more closely with audience expectations. Thus, big data not only enhances market responsiveness but also contributes to a more scientific and data-driven creative process.

4.3. 5G Technology

5G technology provides essential infrastructure for next-generation media experiences. 5G (Fifth-Generation Mobile Communication Technology) is the latest cellular network standard following 4G, characterized by extremely high data transmission speeds, ultra-low latency, and massive connectivity capacity. These features support high-definition video, virtual reality, autonomous systems, and various emerging application scenarios.

Its high bandwidth and low latency enable real-time transmission of high-resolution video and support immersive VR and AR applications. In live broadcasting, 5G allows multi-angle interactive streaming that significantly enhances viewer participation. In production workflows, 5G supports remote collaboration, enabling geographically distributed teams to work together in real time. Cloud-based workflows powered by 5G further support remote rendering and editing, reducing reliance on hardware—particularly beneficial for small studios and independent creators.

Table 1. Core Technologies and Their Applications

Technology	Application Areas	Key Functions	Industry Impact
Artificial Intelligence (AI)	Content creation, post-production, distribution	Automated editing, VFX generation, scriptwriting assistance; intelligent recommendation; image restoration, automated dubbing, subtitle translation	Reduces production costs; enhances artistic precision; supports global dissemination and personalized recommendations
Big Data	Audience analytics, market forecasting, creative decision-making	Analysis of viewer behavior and preferences; sentiment analysis; targeted advertising; dynamic pricing	Optimizes investment and marketing strategies; strengthens alignment between content and audience; improves business efficiency
5G Technology	Live streaming, immersive experiences, remote collaboration, cloud production	High bandwidth & low latency for multi-angle live streaming; supports VR/AR interaction; real-time remote collaboration; cloud rendering and editing	Enhances immersive media experiences; facilitates cross-regional production; reduces equipment dependence; expands modes of audience interaction

Artificial intelligence, big data, and 5G technologies together signal a new stage of development in the film and media industries. AI advances intelligent production and personalized distribution; big data supports evidence-driven decisions and market-oriented

creativity; and 5G provides the infrastructure for real-time, immersive, and distributed production. Their synergy not only increases the efficiency and reach of media content creation and dissemination but also expands the boundaries of audience

interaction and immersive experience. Looking ahead, this technological convergence will foster interdisciplinary collaboration, enhance global cultural exchange, and offer new perspectives for innovation across the arts, culture, and digital media industries.

5. Digital Integration of New Media Technologies in Dance Education

With the rapid development of information technologies, new media has profoundly reshaped various educational models, including dance education. Traditional dance instruction largely depends on face-to-face teaching and on-site practice, but this model is constrained by limited physical space, insufficient individualized guidance, and the difficulty of quantitatively assessing learning outcomes. In recent years, the advancement of artificial intelligence (AI), big data, 5G technologies, and immersive media (including virtual reality, VR, and augmented reality, AR) has created new possibilities for dance education. These technologies facilitate personalized instruction, precise motion analysis, and real-time interaction, while enabling data-driven optimization of curriculum design and teaching strategies. As a result, they enhance learners' technical proficiency, creative capacities, and embodied awareness. Additionally, virtual stages and immersive environments offer simulated performance experiences, enabling students to understand spatial scale, stage layout, and performance rhythm beyond technical training, thereby improving their adaptability to stage performance.

From the perspective of media convergence theory (Jenkins, 2006), the multi-platform, interactive nature of new media is reshaping the communication pathways and learning ecology of dance education, transforming learners from passive recipients into active co-creators of content.

5.1. Applications of Artificial Intelligence (AI) in Innovative Dance Education

Artificial intelligence is primarily applied in motion analysis, personalized instruction, and intelligent teaching-support systems in dance education. AI systems can capture learners' movements through cameras or sensors, analyze motion accuracy, rhythm, and spatial coordination in real time, and provide individualized feedback and correction suggestions. AI also enables learners to perceive body weight distribution, joint coordination, and movement force patterns. Through data visualization, AI strengthens embodied awareness by linking technical feedback with bodily experience.

For example, the Japanese startup AI Dance Coach has developed an intelligent dance learning system that uses real-time motion capture and AI analysis to generate tailored training plans, improving the accuracy and efficiency of movement learning. Beijing Dance Academy employs AI-based motion recognition systems to evaluate ballet fundamentals in real time, generating automated scoring and corrective feedback to support personalized instruction. Through AI technologies, dance education not only achieves individualized learning but also provides teachers with systematic data support to enhance teaching quality and efficiency.

5.2. Big Data and Innovation in Educational Platforms

The integration of big data with educational platforms enables personalized course recommendations, learning behavior analysis, and optimization of teaching resources. By analyzing learning data, institutions can design dance curricula suited to students of different proficiency levels and adjust teaching strategies in real time. The combination of live-streamed and on-demand courses

allows instructors to provide real-time interaction and Q&A while enabling students to review recorded lessons, thus enhancing learning effectiveness and autonomy.

For instance, the Royal Academy of Dance (UK) utilizes its online platform *RADA Online* to recommend suitable training videos based on learner behavior data and AI algorithms, while monitoring learning progress to support individualized instruction. In China, online dance education platforms employ big data analytics to assess learner behavior and feedback, optimize course content, and deliver real-time interactive lessons through live-streaming. This big-data-driven mode of online dance education transcends geographical barriers and facilitates the broad sharing of high-quality instructional resources. Such AI-supported educational innovation aligns with the TPACK framework's emphasis on the integration of technology, pedagogy, and disciplinary knowledge, enabling dance educators to balance instructional strategy and artistic expression within digital environments.

5.3. 5G Technology and VR/AR in Innovative Dance Education

5G technology provides high-speed, low-latency network support, laying the foundation for the integration of VR and AR technologies into dance education. VR and AR create immersive training environments that simulate diverse stage spaces and lighting effects, enabling learners to perceive stage spatiality, interpersonal dynamics, and performance rhythm. Through these immersive experiences, students not only train technically but also engage emotionally, practicing expressive performance and stage presence. From the perspective of affordance theory (Gibson, 1977), VR/AR technologies provide new bodily action possibilities (affordances). By perceiving and responding to virtual spatial feedback, learners reconstruct the relationship between body and space.

A representative example is AfforDance: Personalized AR Dance Learning System, developed by Korean researchers Hyunyoung Han et al. This system converts selected dance videos into interactive learning experiences by integrating 3D avatars, audio synchronization, and adaptive visual cues (visual affordances) to guide movement execution and provide personalized feedback. Han et al. (2025) translate Gibson's notion of "affordance" into a visualized learning mechanism, presenting movement trajectories and joint cues directly through AR, enabling learners to perceive and respond to action possibilities instantly. Based on pose estimation and motion capture, AfforDance creates a perception-action loop supported by adaptive visual prompts and dynamic feedback, improving movement correction cycles and enhancing educational applicability. Research shows that online dance learning significantly improves flexibility, motivation, and self-management while expanding the reach of arts education.

The Royal Ballet (UK) employs VR technology to simulate diverse stage environments and lighting conditions, enabling students to rehearse in virtual stages and strengthen spatial perception and performance timing. In South Korea, AR is used in dance instruction to deconstruct movement sequences, allowing students to view skeletal structures and posture details with enhanced precision. The Shanghai Theatre Academy integrates 5G networks with VR instruction, enabling students to train with VR headsets and receive real-time remote guidance from instructors, achieving efficient cross-regional dance education.

Through 5G-enabled VR/AR technologies, the immersion and interactivity of dance education are significantly enhanced, while providing feasible solutions for remote instruction and educational resource sharing.

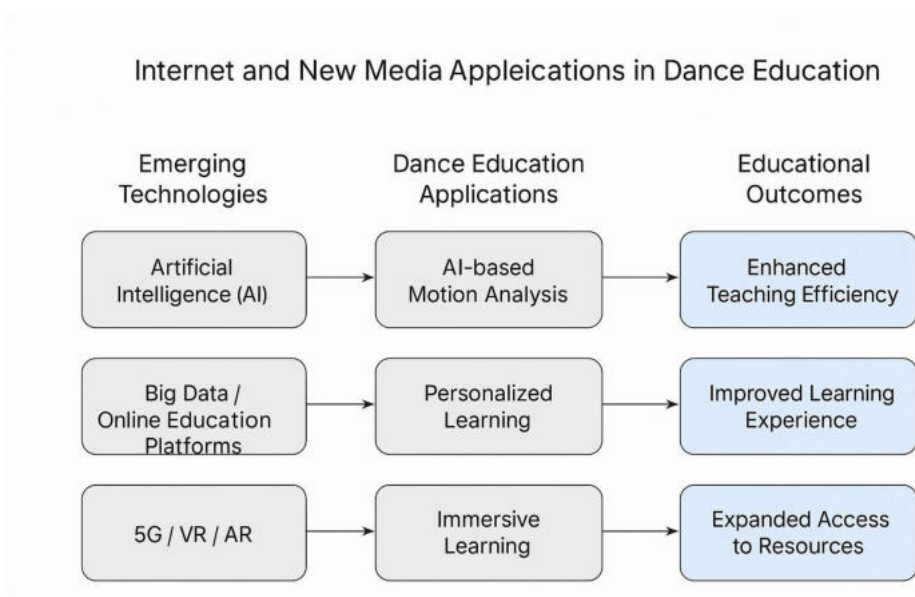


Fig. 1. Internet and New Media Applications in Dance Education

Despite the enormous potential these technologies demonstrate in dance education, several challenges remain. First, hardware costs and technical maintenance continue to limit large-scale implementation. Second, disparities in technological integration capabilities across institutions require educators to possess interdisciplinary digital literacy and instructional design competence. Moreover, how to balance technological assistance with traditional artistic pedagogy—ensuring that technology does not replace the fundamental values of dance as an art form—constitutes an important direction for future research.

The deep integration of artificial intelligence (AI), big data, and 5G technologies is reshaping the landscape of dance education in unprecedented ways. AI-enabled motion recognition and intelligent feedback systems make the learning process more precise and personalized. Big-data-driven online education platforms optimize teaching strategies dynamically through learning analytics and personalized recommendations. Meanwhile, virtual reality (VR) and augmented reality (AR) technologies supported by 5G networks create immersive and interactive learning environments that transcend the temporal and spatial limitations of traditional instruction, significantly enhancing learners' engagement and stage adaptability.

Overall, the convergence of AI, big data, and 5G+VR/AR technologies accelerates the digital transformation of dance education, expanding the boundaries of learning space and perceptual experience while promoting the sharing of educational resources. Yet the core of dance education remains rooted in embodied perception, emotional expression, and stage experience. Future practice should focus on balancing technology with embodied learning and emotion-based training, ensuring that

digital instruction improves efficiency without diminishing the essential artistic value of dance.

As educational digitalization continues to advance, the field of dance education faces several critical questions worthy of reflection—for example, does technological intervention risk diminishing the depth of embodied experience? Might algorithmic learning standardize curriculum content and undermine cultural diversity? Issues concerning educational equity, data ethics, and technological dependence are also becoming increasingly important components of the discourse on innovation in dance education.

6. Implications and Reflections on Dance Education Innovation in the Context of Digital Transformation

With the integrated application of artificial intelligence (AI), big data, 5G communication technologies, virtual reality (VR), and augmented reality (AR), dance education is undergoing a systemic transformation—from teaching methods to educational philosophy, learning models, and cultural dissemination. Technological intervention enables personalized learning, immersive experiences, and remote interaction, making dance education more open and innovative at a global scale. However, this digital transformation also raises profound challenges concerning educational ontology, embodied expression, cultural diversity, and ethical governance. While technology enhances teaching efficiency and interactivity, it may also weaken the embodied experience and cultural specificity fundamental to dance. Based on these dynamics, this chapter discusses the

implications, critical reflections, and pathways for sustainable development of dance education in the digital age, seeking a balance between technological empowerment and humanistic values to support future innovation and cultural transmission.

6.1. Implications: Dissemination and Educational Innovation of Dance Art in the New Media Environment

(1) Intelligent and Personalized Trends in Educational Models

The interactivity and cross-platform communication characteristic of new media create institutional opportunities for the intelligent transformation of dance education. AI and big data make extra-classroom data a critical foundation for instructional design and evaluation. AI—through pose estimation and motion recognition—enables real-time analysis and correction of dance movements, while learning analytics based on big data supports personalized course recommendations and optimization of learning pathways. This shifts instruction from *teacher-centered uniform delivery* to *data-driven individualized support* (for relevant discussion on media convergence and participatory culture, see Jenkins). Such a data-loop-driven pedagogical model (capture → analysis → feedback → adaptation) enhances learning efficiency and offers actionable pathways for differentiated instruction.

(2) Immersive Learning Environments and Cross-Disciplinary Innovation

The high bandwidth and low latency of 5G, combined with the immersive capacity of VR/AR, enable the construction of “immersive-interactive” instructional environments. Empirical studies and case examples show that VR/AR can recreate the spatial perception, lighting, and auditory cues of real stages, thereby enhancing learners’ stage adaptability and spatial awareness. Institutions and professional companies have begun experimenting with cross-disciplinary projects integrating immersive technology with performance practice (e.g., the *Virtual Stage* initiatives of British dance companies), demonstrating how real-time capture, environmental feedback, and audience interaction can jointly support new modes of teaching and artistic presentation. Overall, the synergy of VR/AR, AI, and low-latency networks lays the technological foundation for transforming dance education from “movement training” toward integrated *perception–context–creation*-oriented learning models.

(3) Formation of Global Dissemination and Sharing Mechanisms for Dance Education

The widespread adoption of live-streaming and short-video platforms has reconfigured audience structures and dissemination pathways in dance education. Live-streaming fosters real-time feedback loops among performers, viewers, and learners through interactive tools such as comments and digital gestures. Short-video platforms, leveraging algorithmic recommendation and social sharing, enable the rapid distribution of fragmented instructional content. Studies indicate that these platforms not only enhance learner motivation but also significantly improve the accessibility of dance education. As a result, digital platforms serve not only as channels for curriculum distribution but also as spaces for learning communities and collaborative creation, promoting cross-regional educational sharing and cultural exchange.

6.2. Reflections: Challenges of Embodiment, Culture, and Ethics in Digital Transformation

(1) Alienation of Embodied Experience Under Technological Dominance

Technological tools such as AI-based evaluation, motion capture, and VR environments improve precision and efficiency in movement training. Yet when these tools become the dominant criteria for instruction, dance—as a practice grounded in bodily perception, emotional expression, and improvisational responsiveness—risks being overly quantified and standardized. Excessive reliance on algorithmic feedback may limit teachers’ artistic judgment and encourage learners to focus on machine-measurable indicators (e.g., joint angles, beat alignment) rather than embodied perception and creative expression. This results in a form of embodied alienation, in which the living, subjective body becomes reduced to a measurable object. Educational practice must therefore avoid positioning technology as a substitutive authority and instead regard it as an auxiliary tool that preserves the primacy of embodied experience and artistic values.

(2) Algorithmic Culture and Challenges to Artistic Diversity

Algorithms—whether recommendation systems, motion-recognition models, or visibility-ranking formulas—are not neutral. They filter and amplify content based on training data, design goals, and commercial incentives, potentially creating “visibility biases.” In the context of dance, this may lead to the amplification of dominant body types, popular genres, or visually striking performances, while marginalizing minority dance forms, non-normative body types, or expression-centered practices. Furthermore, AI systems trained on limited datasets may exhibit significant accuracy disparities across different body types and styles, inadvertently reinforcing mainstream cultural norms and reducing diversity. Addressing these issues requires culturally sensitive adjustments in system design, dataset collection, and evaluation criteria.

(3) Rethinking Educational Equity and Data Ethics

Digital teaching and platform-based dissemination expand access but also expose risks related to data governance, privacy, and unequal educational opportunities. Resource-intensive technologies—high-quality VR equipment, motion-capture devices, subscription platforms—may proliferate more readily in economically advantaged regions, exacerbating educational disparities. In addition, platforms’ collection and utilization of learning analytics may raise concerns regarding privacy, data misuse, and opaque evaluation mechanisms. The opacity of algorithmic decision-making (the “black box problem”) may further undermine trust in assessment processes. Solutions include establishing transparent data governance frameworks, adopting inclusive training datasets, and embedding educational equity as a central objective of technological design.

6.3. Strategies for Sustainable Development and Future Directions for Dance Education

(1) Constructing a Human-Centered Digital Education Ecosystem

Studies indicate that sustainable educational technology development must emphasize digital literacy, human-centered design, and equity. Park and Kim (2024) argue that educational technology should foster autonomous learning and creative expression rather than encourage technological dependency. Thus, dance education should prioritize the integration of technology with artistry, avoiding technocentric models that induce embodied alienation. Teachers require systematic professional training to enhance digital pedagogical design capabilities, while platforms should provide diverse resources to accommodate varied learning needs.

(2) Strengthening Interdisciplinary Collaboration and Cultural Diversity Protection

Digital transformation in dance education should respect cultural diversity and avoid visibility biases introduced by algorithmic recommendation. Zhao (2022) emphasizes that digital technologies should support, rather than replace, the transmission and innovation of traditional dance. Interdisciplinary collaboration with the humanities and social sciences can enrich explorations of digital applications in dance education. Moreover, attention to cultural difference is required to protect the uniqueness of diverse dance traditions.

(3) Promoting Educational Equity and Ethical Governance

Digital dance education must address issues of equity and data ethics. Xia (2025) notes that digital transformation may exacerbate disparities between urban and rural regions or across socioeconomic groups. Policies should therefore ensure equitable distribution of technological resources. Robust frameworks for data governance and ethical oversight are also essential to protect learners' privacy and ensure data security.

(4) Developing Sustainable Evaluation and Feedback Mechanisms

Sustainable dance education requires diversified evaluation and feedback systems. Li (2025) argues that online dance education should attend to learner engagement, motivation, and skill retention. Accordingly, a combination of self-assessment, peer assessment, and instructor assessment is needed to evaluate learners comprehensively. Meanwhile, technological tools can support immediate feedback to enhance self-regulation and continuous improvement.

In summary, the sustainable development of dance education requires a balanced integration of technological application, educational philosophy, and cultural transmission. Only by constructing a human-centered digital ecosystem, promoting interdisciplinary collaboration and cultural diversity, ensuring equity and ethical governance, and establishing sustainable evaluation mechanisms can dance education achieve long-term, meaningful development in the digital era.

7. Conclusion

With the rapid advancement of digital technologies, dance education is entering a new stage of development. Technologies such as artificial intelligence (AI), big data, 5G communication, virtual reality (VR), and augmented reality (AR) have enhanced instructional efficiency and personalized learning, providing strong support for innovation in dance education. However, as an art form fundamentally rooted in embodied perception, emotional expression, and creativity, dance cannot rely solely on technological mediation. While AI and motion-capture systems provide precise analysis and feedback, excessive dependence on these systems risks generating embodied alienation. Similarly, although VR/AR technologies can create immersive learning environments, emotional engagement and improvisational responsiveness still require pedagogical guidance. Therefore, maintaining a dynamic balance between technological use and embodied experience is essential for preserving the core artistic values of dance education in the digital transformation.

Grounded in the TPACK framework, media convergence theory, and affordance theory, this study proposes a "technology–culture–body" tri-dimensional interactive model, elucidating the mechanisms by which technology, pedagogy, and disciplinary knowledge can be integrated in dance education, while highlighting the crucial roles of cultural context and embodied perception in digital learning environments. The findings indicate

that teachers can leverage technology to design personalized and immersive curricula, and that institutions can utilize new media platforms to facilitate resource sharing and global dissemination, thereby enhancing learner motivation and stage adaptability. At the same time, the study identifies potential cultural biases embedded in algorithmic recommendation systems, offering insights for optimizing instructional content and safeguarding cultural diversity.

Future research should focus on:

(1) differences in embodied experience across dance genres and age groups in digital learning environments;

(2) the impact of algorithmic recommendation systems on the preservation of dance-cultural diversity;

(3) the development of teacher digital literacy training systems; and

(4) the applicability of the tri-dimensional interactive model in cross-cultural dance education contexts.

Overall, this study proposes a theoretical framework for digital dance education, reveals pathways for balancing technology, embodiment, and cultural diversity, and provides theoretical and practical guidance for innovation and sustainable development of dance education in the global digital era.

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Linan Liu: Conceptualization; Investigation; Methodology; Writing – Original Draft Preparation; Writing – Review & Editing.

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Competing Interest declaration

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