ISSN 2522-6398 Vol. 6, Issue 31: 74-78, DOI: 10.25236/FER.2023.063113

Analysis of Transformation of Dance Teaching Model Equipped with AI Technology

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Abstract: *At present, a new round of global scientific and technological revolution and industrial transformation is booming. New technologies, new products, and new business models are accelerating its extensive penetration to all fields. As a representative of the new round of scientific and technological revolution, 5G, AI and other new generation of information technologies have integrated into the education industry, promoting the continuous reform and development of the education industry. Applying AI technology to dance teaching could enable a significant improvement in efficiency and quality of dance teaching. In this paper, through the case study method, AI technology is studied in the transformation of the dance teaching model, which could help to provide a reference for the future intelligent dance education program.*

Keywords: *AI technology; dance; teaching model; transformation*

1. Introduction

At present, applying new-generation information technologies (e.g., AI) into education has become a hot spot, and AI has been widely used in daily life. China has issued a "New Generation Artificial Intelligence Development Plan" and put forward the "use intelligent technology to accelerate the reform of talent cultivation model and teaching methods, build a new type of education system including intelligent learning and interactive learning". China has also issued “China's Education Modernization Towards 2035”[1] and proposed to build an integrated intelligent teaching, management, and service platform in a coordinated manner, and accelerate the reform of the talent cultivation model by using modern technology. In the field of dance education, with the rapid development of digital art and the advancement of stage technology, the traditional dance teaching model and method are more and more difficult to meet the teaching needs of intelligent dance education courses in the future. Therefore, the research on exploring the integration model of AI and other modern technologies and dance teaching will help the personalization and scientification of dance teaching.

2. Overview of AI Technology and Dance Teaching Model

2.1 Concept of Teaching Model

"Model" is a structuralist term that refers to the subjective rational form used to describe the structure of something.[2] Dewey defines teaching as a specific environment designed or created by educators for learners to experience growth.[3] Therefore, an instructional model can be understood as a learning environment and the structural form of a teacher's instructional behavior under that environment. Regarding the definition of a teaching model, Joyce, Weil, and Calhoun consider it as "a plan for constituting a curriculum (a course of study over a long period), selecting materials, and directing teaching and learning activities in a classroom or other environments." Thus, a complete instructional model must be theoretically guided, aiming to achieve specific instructional goals. It should contain specific strategies to guide the design of teaching elements (e.g., teaching sessions, behaviors, materials, etc.).

2.2 Overview of AI Technology + Education

In the education industry, the integration of "AI" and "education" has given birth to the concept of "AI education", and triggered in-depth research by scholars at home and abroad (As shown in figure 1).[4]

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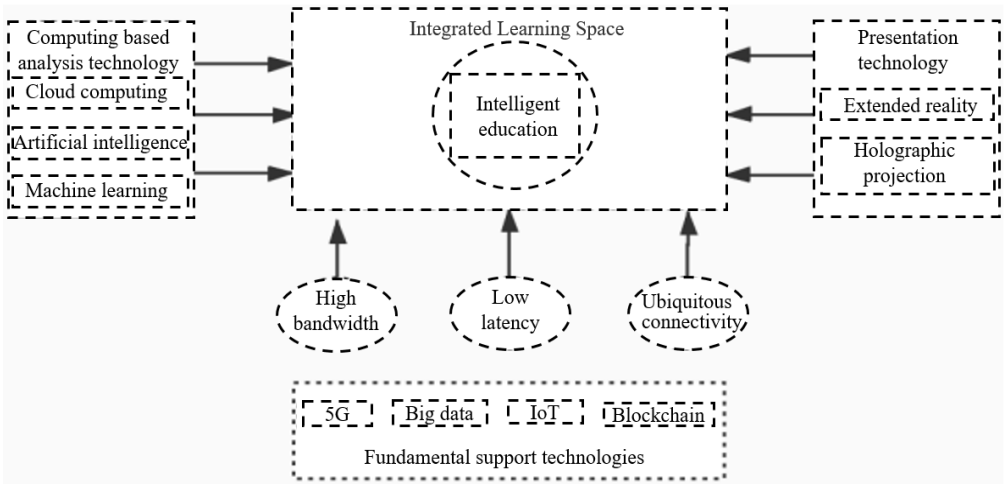

Figure 1. AI enabled education technology[5]

2.2.1 Definitions of AI Education

Table 1 shows the scholars' definition of AI education.

Table 1. Definitions of AI Education among scholars

No.	Name	Published time	Definition
1	Johnson[6]	2008	It is an AI tutor that utilizes its own understanding to respond to students' questions and assess their abilities.
2	Dishon[7]	2017	It is an intelligent system that could assist teachers and students in personalized teaching and studying.
3	Kakish[8]	2018	It is an intelligent tutor system that could simulate one-on-one teaching by a teacher to a student and is able to capture the student's learning situation to provide targeted teaching guidance.
4	Zhai Xuesong[9]	2020	It is a computational system capable of simulating human learning, correction, and processing complex data tasks.

2.2.2 Effectiveness of AI Technology in Teaching

With the innovation of AI technology, the definitions of AI education among foreign scholars have become clearer, more intelligent, and scene-oriented. With the upgrading of the definition of AI education, foreign experts are also practicing and exploring the applications of AI education. They have argued the positive and negative impacts of AI technology on teaching in the fields of adaptive learning, teaching evaluation, virtual classroom and intelligent teaching robots (As shown in table 2).

Table 2. Impacts of AI on teaching

Positive impacts	Negative impacts	Other impacts
1. AI could effectively help students to improve their study performance. 2. AI technology could enhance students' interests and motivations in learning. 3. AI technology could effectively improve students' attendance. 4. AI technology could assist teachers to improve teaching decision-making and achieve scientific teaching management. 5. AI technology could effectively help both teachers and students to achieve win-win results in teaching.	1. The involvement of AI in teaching directly would increase human-computer communication, which is not conducive for students to participate in society. 2. The involvement of AI technology in teaching would weaken the status of teachers and intensify ethical pressures on them. 3. AI education would introduce big data technology into teaching, which would directly raise the ethical risks of the data and violate the privacy of teachers and students.	Compared with traditional teaching, teaching involved with AI does not enhance students' learning effectiveness.

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3. Difficulties in Current Dance Teaching Model

3.1 Lack of Personalized Teaching

Dance courses feature abundant content, little class time, and short learning time. Meanwhile, the process of dance learning is full of difficulties. Consequentially, it must be taught step by step. However, due to the large number of students and the large gap among dance fundamentals of students, the dance teaching process is difficult and complicated. As a result, teachers could only adopt the traditional "demonstration-performance" method for indoctrination in order to complete the teaching progress. In this way, it is contrary to the teaching concept of putting students first, and could not guarantee the stratified teaching or personalized teaching.

3.2 Unitary Evaluation

Dance courses have not formed a complete and standardized evaluation system. Most schools only formulate a rough grading scale to score or grade students' dance performance by relying on their teaching experience. As a result, many teachers fail to evaluate a student’s learning attitude, classroom performance, and practical performance during the procedure of dance learning, which could not fully reflect the quality and ability of a student in the dance classroom. This kind of unitary teaching evaluation is not conducive to students' learning and innovation in dance.

4. Transformation of AI Technology Enabled Dance Teaching Model

4.1 Intelligent Dance Training Data Analysis

Traditional dance teaching models could not perform well in teaching effect due to limitations on time, space, resources and methods and other factors. Such a teacher-centered teaching model not only could not achieve personalized teaching, but also would have a negative impact on the learner's independent learning. We should introduce AI intelligence into dance teaching in a reasonable way, so as to realize the scientific transformation of the dance teaching model and teaching method. With the help of movement analysis technology in AI, the dance learning content that is suitable for the actual situation of the learners could be integrated in an intelligent way based on the dance movement training and corresponding data feedback of a learner, so as to provide scientific assistance for the dance movement practice and technical extension of learners in the recent period. Secondly, with the help of movement analysis technology in artificial intelligence, personalized training grading reports could be generated for the learners according to their dance training data, so that the learner could clearly identify the problems in his or her own dance movements. In this way, the training deviations can be corrected in a targeted manner, and the blind spots in the movement training can be compensated effectively. Finally, through scientific, objective and rich student portraits, class portraits and other visual learning data, dance teachers could get to know about the dance learning progress, attitude and degree of each student, and realize the accurate review and control of the learning process and learning path of each learner. They could further use the data to better explore the potential level of each learner. Those data could provide scientific and effective evidence for the teachers to reflect on teaching, optimize the teaching method and adjust the teaching strategy, which is significantly important for the improvement of dance teaching efficiency and effectiveness.

4.2 AI enabled Holographic Reconstruction of Dance Learning Space

In “The Global Framework for Education 4.0”, utilizing new technologies to build a new future learning form has been proposed. With the development of virtual reality technology, 5G technology and holographic technology, the boundary between reality and virtual has been blurred. The development of holographic technology, AI technology and digital twin technology have provided more possibilities for building intelligent learning environments.

Essentially, dance is a comprehensive art that is mainly visual and combines audio and visual. Based on the theory of multimodal learning space, students should be the main participant in the cognitive immersion experience in the constructed multimodal learning space of dance. Learning Spaces is a complex, multidisciplinary crossing research field and is also an important infrastructure for schools to carry out teaching activities. Dance immersive learning space is to use immersive technology for dance learners to build an immersive learning environment combined with both the virtual world and the real

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world. With the help of 3D holographic digital technology to connect the physical space and the virtual space, we could build a mutual construction of audio-visual and cultural immersion for the dance perception in the intelligent space interconnected by cultural experience, dance perception, and dance movement. It could help to break through drawbacks in the traditional teaching, such as unobservable and difficult to communicate, difficult to understand knowledge and other teaching difficulties. Besides, it could improve the content, structure, form, environment, method and effect of learning and teaching.(As shown in figure 2)

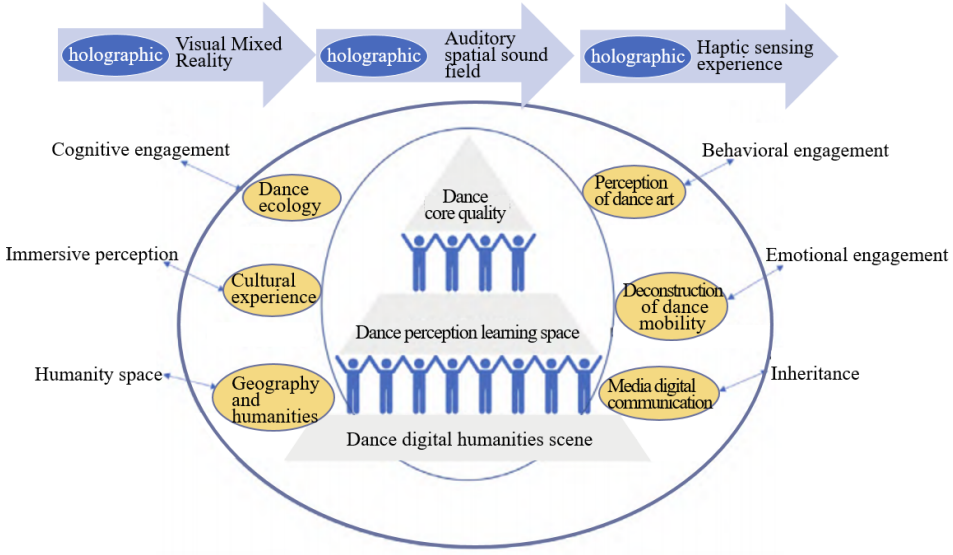

Figure 2. Holographic Dance Learning Space[10]

4.3 AI Enabled Dance Teaching Intelligent Choreography

Dance is an art form that needs practicing. Choreography is the creative mastermind of a dance work. During the process of choreography teaching, dance teachers need to undergo more professional training so as to create expressive dance works. Choreography has always been a difficult part of traditional dance teaching. The introduction of AI has made choreography more intelligent.

In a Japanese dance performance called "discrete figures," an AI dancer is projected onto the stage and performs alongside a real dancer. The program also showcases a partially trained neural network that uses footage of audience members dancing as input data to generate performance videos. The dance is collaborated by Japanese digital art collective Rhizomatiks, multimedia dance troupe Elevenplay, and media artist Kyle McDonald. McDonald invited eight dancers for “Discrete Portraits”, recorded motion-capture data from each dancer's improvised 2.5-hour dance performance. Using NVIDIA GPUs, the training data was fed into a neural network called “dance2dance”, which generates movements that can be rendered into 3D character line drawings. The virtual dancer first performs dance movements pre-generated by the neural network, and then performed a dance choreographed by Mikiko, the company's choreographer. Maruyama and the AI dancers synchronized their dance movements until she left the stage. After that, the projections faded back to silver silhouettes, and the virtual dancers resumed dancing the AI-generated choreography. The AI not only reflects the movement styles of an individual dancer, but also combines the movement styles of different dancers to create hybrid movement sequences that are not available in the existing archive, which provides choreographers with new creative ideas and shows great choreographic potential.

4.4 Intelligent Evaluation Strategy for Dance Teaching

The evaluation method of dance teaching based on AI technology can be used to understand the cognitive process (learning performance, test, examination), emotional process (sentiment analysis) and behavioral process (click data) of the learners with the help of big data mining and multimodal learning analysis technology. On the one hand, through big data learning analytics technology to track students' dance learning status, interaction and cognition, we could achieve comprehensive monitoring of learning activities, real-time feedback on the progress of learning, and thus effectively helping students carry out personalized learning. On the other hand, methods that include emotional content are utilized for

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measurement. For example, to measure the perception of dance, different words can be selected according to the dance form, scene characteristics, regional characteristics, etc., By corresponding brain imaging with digital quantification, we could generate feedback on aesthetic emotions and cognition with the help of neural modeling. Through the analysis of these data, students' interactions and even emotional states could be evaluated. This automated assessment model could effectively construct a regular intelligent learning trajectory model, and then compare each student's learning performance with a typical learning performance model constructed on the basis of the majority of students. It is helpful to appropriately give real-time feedback to students during the procedure of solving problems, and promote the students' ability to identify problems, cognitive problems and solve problems, so as to further effectively stimulate students' innovative thinking in dance aesthetics.

5. Conclusion

In this paper, we analyzed the new changes after the integration of AI technology and dance teaching. The rapid emergence of information technology is bringing unprecedented changes to dance education. It is also reshaping, leading and changing dance education. Moreover, it is also prompting the innovative development of dance aesthetic education. We believe that the participation of AI technology expands the traditional form of dance teaching, enriches the concept of aesthetic education, and broadens the scenarios of aesthetic education digitization. Only when technology and education form a new ecology can education be truly transformed.

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