

Construction and Research on the "Three-dimensional" Curriculum Model of Dance in Secondary Vocational Schools from the Perspective of Digitalization and Intelligence

Luo Longzhu and Lee Keok Cheong

Abstract – Against the backdrop of the in-depth advancement of China's digitalization strategy in education and the high-quality development of vocational education, secondary vocational dance courses, as the core base for cultivating applied dance talents, are now confronted with the predicament of the disconnection between traditional teaching models and the demands of The Times. At present, the majority of dance teaching in secondary vocational schools follows the model of "teacher demonstration and student imitation", which leads to three major problems: monotonous technical training, weak artistic creation, and superficial cultural understanding. To break through the above-mentioned predicament, this study, based on the deep integration of digital intelligence technology and dance teaching, supported by constructivist learning theory, situational learning theory and the TPACK framework, has constructed a three-dimensional integrated curriculum model of "technical training - artistic creation - cultural understanding", and adopted a method combining design-oriented research and action research. Two rounds of teaching practice were carried out for 180 students majoring in dance from three secondary vocational schools. The results show that this model has increased the accuracy of students' dance movements by more than 30%, significantly enhanced their creative ability, greatly improved their cultural identity level, and achieved the coordinated development of skills, creativity and cultural literacy. The innovation of this research lies in the systematic integration of digital and intelligent technologies with dance teaching, establishing a "three-dimensional collaboration and integration of technology and culture" curriculum system. This provides a feasible path for the digital and intelligent transformation of dance majors in secondary vocational schools. At the same time, through the digitalization of intangible cultural heritage dance resources, it injects new vitality into the dynamic inheritance of intangible cultural heritage.

Keywords – Digital intelligence, Secondary vocational dance, Three-dimensional curriculum model, Intangible cultural heritage inheritance

I. INTRODUCTION

We Entering the third decade of the 21st century, digital and intelligent technologies represented by artificial intelligence, big data, virtual reality and motion capture are profoundly reshaping the educational ecosystem. In 2022, the Ministry of Education launched the National Education Digitalization Strategy Action, explicitly stating the need to promote the digital transformation of education. Policy documents such as the "Opinions on Promoting High-Quality Development of Modern Vocational Education" also emphasize that vocational education must adapt to the new

requirements of economic and social development and cultivate high-quality technical and skilled talents. Against this macro backdrop, secondary vocational dance courses, as the core base for cultivating applied dance talents, shoulder the important mission of "educating people through beauty, cultivating people through culture, and establishing oneself through skills". However, the current secondary vocational dance teaching generally face difficulties. Through on-site investigations of many secondary vocational schools, it can be found that the vast majority of dance classes still follow the master-apprentice teaching model of "teacher demonstration and student imitation". The limitations of this model are mainly reflected in three aspects: First, technical training focuses on mechanical imitation of standardized movements, lacking precise digital and intelligent guidance, making it difficult to take into account individual differences among students. Secondly, the artistic creation process has been severely weakened, with students overly relying on the formulaic patterns in textbooks and lacking in innovation and practical abilities. Thirdly, the understanding of culture remains superficial. Teaching fails to explore the cultural connotations behind the dance, resulting in students' expressions lacking emotional depth and cultural appeal. The existence of these three predicaments not only restricts the improvement of the quality of dance talent cultivation in secondary vocational schools, but also forms an internal tension with the educational concept of "cultivating both virtue and skills" in the new era of vocational education. Based on the understanding of the real problem, this study attempts to explore several intellectualization technology and secondary path of dance teaching depth integration, build and verify that it is able to integrate technology training, the artistic creation and cultural understanding three dimensions of the new curriculum. Specifically, the research attempts to answer three core questions: First, how to construct a curriculum model that organically integrates the three dimensions? What is its theoretical basis and internal logic.

II. PROBLEM STATEMENT

The core issue that this research focuses on can be summarized as: How to construct and verify a model of secondary vocational dance courses supported by digital and intelligent technologies to effectively solve the three predicaments existing in current teaching: the singularity of technical training, the weakness of artistic creation, and the superficiality of cultural understanding? Specifically, this study attempts to answer the following three sub-questions: First, how to construct a secondary vocational dance curriculum model that can organically integrate the three dimensions of technical training, artistic creation, and

Luo Longzhu, City University of Malaysia/Tiankebing Senior Vocational School, (Email address: luo_longzhu@126.com)
Lee Keok Cheong, City University of Malaysia

cultural understanding? What is the theoretical basis of this model? How does its internal logic unfold? Secondly, in a real classroom teaching context, how can this three-dimensional curriculum model be specifically implemented? How should various digital intelligence tools (such as VR, motion capture, AI tutoring systems, virtual creation platforms, AR scenario reproduction, etc.) be integrated into teaching practices of all dimensions? Thirdly, can this curriculum model effectively enhance the movement accuracy, creative ability and cultural identity level of secondary vocational school dance students? How effective is its implementation? What problems exist and what room for improvement is there? The above problems are put forward, based on the system of current school dance teaching present situation diagnosis. The homogenization of technical training is manifested in teaching overly focusing on mechanical imitation of standardized movements, lacking attention to individual differences among students, resulting in some students being "underfed" while others "unable to keep up". The weakening of artistic creation is manifested in the marginalization of the creative link in the curriculum system, students lack systematic creative training, and their creative expression and problem-solving abilities are seriously insufficient. The superficial understanding of culture is manifested in teaching remaining at the level of imparting dance forms, failing to guide students to understand the historical context, cultural connotations and values behind the dance, resulting in dance performances being "form without spirit". These three predicaments are interrelated and reinforce each other, forming a "vicious circle" that hinders the improvement of the quality of dance education in secondary vocational schools. Therefore, constructing an integrated curriculum model that can simultaneously break through the three predicaments has become the current trend in secondary vocational dance education.

III. LITERATURE REVIEW

Research on the Application of Digitalization and Intelligence in Dance Education

In recent years, scholars at home and abroad have begun to pay attention to the application of digital and intelligent technologies in dance education. From an international research perspective, the earliest exploration was the use of motion capture technology to assist dance training. Researchers used motion capture systems to conduct three-dimensional modelling and quantitative analysis of dancers' movements, helping dancers identify and improve technical details. For instance, relevant studies abroad have shown that the visual feedback provided by motion capture technology can significantly enhance dancers' metacognitive ability regarding their own movements. Domestic research has focused more on the application attempts of VR and AR technologies in dance teaching. Some scholars have utilized virtual reality technology to create immersive dance learning environments and found that VR environments can help reduce the anxiety of beginners and enhance the continuity of practice. Other scholars have explored the application of augmented reality technology in dance teaching, achieving interactive training of duets through virtual dance partners.

However, most of the existing research remains at the level of introducing technical tools and presenting application cases, lacking in-depth exploration of how technology systematically reconstructs the curriculum model. Most studies focus on the application effect of a single technical tool in a certain teaching link, rather than how the technology is deeply integrated with the overall framework of the course. Furthermore, existing research also lacks systematic attention to the collaborative mechanism among technical training, artistic creation, and cultural understanding.

Research on the Reform of Dance Curriculum in Secondary Vocational Schools

Research on the reform of dance courses in secondary vocational schools mainly focuses on the update of course content, the improvement of teaching methods, and the transformation of evaluation methods. In terms of course content, some scholars have proposed that modern dance, choreography techniques, and dance appreciation should be added to enrich the knowledge dimension of the course. In terms of teaching methods, modern teaching concepts such as project-based learning, flipped classrooms, and cooperative learning have been introduced into the research of dance teaching. In terms of evaluation methods, some scholars advocate the establishment of a multi-dimensional evaluation system that combines process evaluation with summative evaluation. However, there are two obvious deficiencies in the existing research. Firstly, the focus on digital and intelligent technologies is not deep enough. Most research still remains at the application level of traditional technical means such as video playback and multimedia courseware, and has not fully paid attention to the potential for teaching transformation brought by new-generation technologies such as VR, AI, and motion capture. Secondly, there is a lack of systematic construction of the curriculum model. Research often focuses on the partial improvement of a single teaching link, such as the introduction of a certain teaching method or the addition or deletion of a certain content, but lacks the overall reconstruction of the curriculum objectives, content, implementation and evaluation.

The identification of research blanks

Based on the above literature analysis, the main gaps in the current research can be identified. First, there is a lack of research on systematically integrating digital and intelligent technologies into the overall framework of secondary vocational dance courses. Second, there is a lack of research on constructing curriculum models by taking technical training, artistic creation, and cultural understanding as collaborative dimensions. Thirdly, there is a lack of empirical research on the digital and intelligent curriculum model of dance in secondary vocational schools, especially a lack of design-oriented research and action research based on real teaching scenarios. This study precisely addresses the aforementioned gaps, attempting to construct and verify a three-dimensional integrated curriculum model supported by digital intelligence, with the aim of providing theoretical support and practical reference for the digital and intelligent

transformation of dance education in secondary vocational schools.

IV. METHOD

Research design

This study adopts a methodological approach that combines design research with action research. Design-oriented research is a research paradigm that, in real educational contexts, through iterative design, implementation and analysis, simultaneously develops effective intervention plans and theoretical understanding. Its core features include conducting research in a naturalistic context, adopting iterative design, integrating multiple research methods, and focusing on the transferability of intervention programs. The reason why this paradigm is suitable for this study is that the construction of the three-dimensional curriculum model itself is a design process that requires continuous adjustment and optimization in practice. Action research emphasizes the collaborative efforts between researchers and practitioners, identifying problems, taking actions, reflecting on effects, and continuously improving in real practical scenarios. The combination of the two methods not only ensures the systematicness and theoretical depth of the research, but also guarantees its practical pertinence and operability.

Object of study

This study selected the dance majors of three secondary vocational schools as practical bases. These three schools are respectively located in the eastern coastal area, the central region and the western region, covering different levels of economic development and educational resource endowments. This choice aims to enhance the external validity of the research conclusions. Each school selected one dance major class to participate in the research, with a total of 180 students. Among them, there are 42 boys and 138 girls, with ages ranging from 15 to 18. All students have received basic dance training before enrollment, but their levels vary. In addition, six dance teachers participated in this study, with teaching experiences ranging from 3 to 15 years.

Research process

The research process is divided into two stages. The first stage for pilot optimization stage, for eight weeks. At this stage, the research team selected one class from each school as a pilot to implement the initially designed three-dimensional curriculum model. During this period, the research team collected data through methods such as classroom observation, monitoring of learning behaviour data, and student focus group interviews. Classroom observations are conducted twice a week in each school. Learning behaviour data is automatically recorded by the AI system. Student focus group interviews are conducted twice in each school. Based on the data analysis results, the research team identified the problems in the implementation of the pattern and made corresponding optimization and

adjustment to the course design. The second stage for the comprehensive promotion stage, for 12 weeks. Based on the optimized three-dimensional curriculum model, the research team fully implemented this model in all participating classes of the three schools. In terms of evaluation methods, a combination of quantitative and qualitative approaches is adopted to systematically detect changes in students in three dimensions: movement accuracy, creative ability, and cultural identity.

Data collection and analysis

This study simultaneously collected quantitative data and qualitative data. Quantitative data includes three aspects: Movement accuracy. Through the motion capture system, the movement data of students before and after measurement are collected, and indicators such as joint Angle errors and centre of gravity offsets of key movements are calculated. The creative ability was measured using the adapted "Dance Creative Ability Scale", which includes four dimensions: creative conception, structural organization, movement development, and stage arrangement, with a total of 16 items, and uses a 5-point Likert scale. Cultural identity was measured using the "Intangible Cultural Heritage Dance Cultural Identity Scale", which consists of three dimensions: cultural cognition, emotional belonging, and willingness to inherit, with a total of 12 items. Qualitative data including the classroom observation and teacher interviews, students' reflection log. Classroom observation records are written by researchers, with a focus on students' participation, the quality of interaction, and the use of technology. Student reflection logs are collected once a week to understand students' learning experiences and cognitive changes. Teacher interviews were conducted after the second round of practice. Six teachers were interviewed in a semi-structured manner to understand their judgments on the effectiveness and feasibility of the model. Quantitative data using SPSS software to descriptive statistic and paired sample t test analysis, qualitative data is processed with the method of theme analysis.

V. FINDINGS

Feedback from the first round of practice and model optimization

After the first round of practice, the research team conducted a systematic analysis of the collected data, identified three main problems and made optimizations. The first problem is that the operation threshold of technical equipment is relatively high. Some students felt unaccustomed to the use of VR devices and motion capture systems in the early stage, making frequent operational mistakes, which affected their learning efficiency. In response to this issue, the research team increased the technical operation training from 2 class hours to 4 class hours and produced concise operation guide videos. The second problem is that the connection among the three dimensions is not natural enough. Some teachers have reflected that technical training classes, art creation classes and cultural understanding classes are relatively independent in terms of time arrangement and lack organic integration. In

response to this issue, the research team adopted the "thematic unit" model, coordinating and arranging teaching activities in three dimensions around a single dance theme. The third issue is the insufficient depth of use of virtual creation platforms. Some students only use the basic functions of the platform and fail to make full use of the creative tools. In response to this issue, the research team added a "Creation Tool Workshop", inviting platform developers to receive advanced functional training.

The effect test of the second round of practice

After the second round of practice, the research team conducted a pre - and post-test comparative analysis of 180 students and obtained the following main findings: In terms of movement accuracy, the average accuracy of students' key dance movements increased by 31.7%. Data from the motion capture system showed that the joint Angle error decreased from an average of 5.8° to 3.9°. The results of the paired sample t-test indicated that the difference was statistically significant ($t=9.34$, $p<0.001$). The centre of gravity offset decreased from an average of 4.2cm to 2.7cm ($t=8.76$, $p<0.001$). Teacher interviews reflect that the real-time feedback from the AI system has helped students detect subtle movement deviations that were previously difficult to notice, such as the trajectory of arm extension and the coordination of head rotation angles. In terms of creative ability, all dimensions of the "Dance Creative Ability Scale" have seen significant improvements. The dimension of creative conception increased by 28.4%, the dimension of structural organization by 25.9%, the dimension of movement development by 32.1%, and the dimension of stage scheduling by 23.6%, all reaching the statistically significant level ($p<0.01$). Qualitative data analysis shows that the "instant preview" function of virtual creation platforms has reduced the cost of creative verification, transforming students from "daring not to create" to "enjoying creating". A student wrote in a reflection log: "Before, I thought choreography was very difficult because I didn't know if it would look good after the changes." "Now you can see the effect immediately on the platform. It's very free to make changes, and I have more and more ideas." In terms of cultural identity, all dimensions of the "Intangible Cultural Heritage Dance Cultural Identity Scale" have seen significant improvements. The dimension of cultural cognition increased by 35.6%, the dimension of emotional belonging increased by 29.3%, and the dimension of inheritance willingness increased by 40.2%, all reaching the statistically significant level ($p<0.001$). Among all the intervention methods, AR scenario reproduction is regarded as the most effective. A student shared, "When I was learning Mongolian dance before, the teacher just said

VI. DISCUSSION

Explanation of the core mechanism

The core mechanism behind the remarkable achievements of the three-dimensional curriculum model can be summarized as "three-dimensional collaboration empowered by digital intelligence". First of all, digital and intelligent technologies have solved two major problems that

have long existed in traditional teaching. The issue of taking into account individual differences. In traditional large-class teaching, it is difficult for teachers to simultaneously take into account the different learning progress and technical difficulties of each student. However, the AI tutoring system can provide differentiated training plans based on each student's level, achieving true teaching according to individual aptitude. The second is the issue of making tacit knowledge explicit. In dance teaching, there is a large amount of physical knowledge that teachers can only understand but find hard to express in words. However, motion capture technology transforms these indescribable physical sensations into visual data feedback, significantly lowering the learning threshold. Secondly, the synergy among the three dimensions has produced an effect of "1+1+1>3". Technical training is no longer a mechanical exercise detached from artistic creation and cultural understanding, but has become the physical foundation for meaningful expression and in-depth understanding. Artistic creation is no longer a "fantasy" divorced from technical roots, but a natural extension of technical ability and cultural understanding. Cultural understanding is no longer theoretical learning on paper, but a life experience gained through physical practice. This collaborative relationship responds to the core claims of constructivism and situational learning theory: learning is holistic, context-driven, and meaningful.

Dialogue with existing research

The results of this study echo the existing research and fill an important research gap at the same time. Early research on motion capture-assisted dance training also reported the role of technology in enhancing movement accuracy, but this study further reveals the potential of technology in stimulating creation and deepening understanding. In addition, most existing studies have focused on higher education or professional dance colleges, while this study turns its attention to secondary vocational education, an important but often overlooked field. In response to the concerns of some scholars that the intervention of technology may weaken the humanistic nature of dance, the results of this study show that when technology is appropriately integrated into the curriculum model aimed at "three-dimensional collaboration", it not only does not weaken the humanistic nature, but also enhances students' understanding and emotional connection with the cultural connotation of dance through the creation of scenarios and the digitalization of cultural resources.

VII. CONCLUSION (OR LIMITATION OR SUGGESTION FOR FURTHER STUDIES)

Research limitations

This study has several limitations. First, the research period is relatively short, with a total practice time of 20 weeks. The long-term effect still needs to be tracked and verified. Can the three-dimensional curriculum model continue to play a role? Do students still maintain a high level of creative ability and cultural identity after being separated from digital and intelligent tools? These questions

require subsequent follow-up studies to be answered. Secondly, although the sample covered schools from three different regions, only one class from each school participated, and the total sample size was 180 people. The universality of the conclusion still needs to be verified through the practice of more schools. Future research should expand the sample range to cover more regions and more types of secondary vocational schools. Thirdly, the differences in digital and intelligent infrastructure may affect the replication effect of the model. The hardware such as VR devices, motion capture systems and AI systems that this research institute relies on have relatively high costs, which may be difficult for schools in economically underdeveloped areas to afford. How to achieve a "lightweight" three-dimensional course model under resource-constrained conditions is a question that needs to be further explored.

Theoretical significance and practical significance

From a theoretical perspective, this study introduces constructivist learning theory, situational learning theory and the TPACK framework into the field of secondary vocational dance education, expanding the application boundaries of the above theories in vocational education and art education. At the same time, it also provides a new analytical framework for the theoretical research of secondary vocational dance education curriculum. From the practical level, this study through the combination of design type research and action research, in the teaching to verify the effectiveness of the three-dimensional curriculum mode, as the number of intellectualization transformation dance professional technical secondary school provides operational and reproducible practice path. The digitalization of intangible cultural heritage dance resources and the reproduction of AR scenarios involved in the research provide innovative ideas for the dynamic inheritance of intangible cultural heritage in vocational education. In addition, the model and methods of this study can also provide referenceable experience for the digital and intelligent reform of other secondary vocational art majors (such as music, fine arts, drama, etc.).

Future research direction

Future research can be deepened in the following directions. First, conduct longitudinal tracking studies to examine the long-term effects of the three-dimensional curriculum model, especially its impact on students' career development and lifelong learning ability. Second, explore a "lightweight" three-dimensional curriculum model and seek low-cost and high-efficiency digital and intelligent teaching solutions under resource-constrained conditions. Thirdly, extend the three-dimensional curriculum model to other art-related majors to test its cross-disciplinary applicability. Fourth, conduct in-depth research on the micro-mechanisms of three-dimensional collaboration, such as analyzing the cognitive transformation process of students between technical training and artistic creation through the micro-occurrence method.

ACKNOWLEDGEMENT

The successful completion of this research would not have been possible without the strong support and assistance from multiple parties. We sincerely thank the school leaders, dance teachers of the three cooperating secondary vocational schools and the 180 students who participated in the research. We appreciate their precious time and sincere cooperation in the midst of their busy teaching and learning tasks for this research. Thank you to all the members of the research team for your hard work and close collaboration. Thank you to the relevant digital and intelligent technology enterprises for providing equipment support and technical guidance. Finally, I would like to express my gratitude to all the experts and scholars who have provided guidance and suggestions during the process of writing this thesis. This research was supported by [Please fill in the name and number of the fund project here]. Special thanks are hereby expressed.

REFERENCES

- Ministry of Education of the People's Republic of China. (2018). 2.0 education informatization action plan [Government document].
- The State Council of the People's Republic of China. (2019). National vocational education reform implementation plan [Government document].
- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60–70.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Wang, X. H., & Li, N. (2021). The application of virtual reality technology in dance teaching research. *China Educational Technology*, (8), 92–97.
- Zhang, H., & Liu, Y. (2022). Secondary dance curriculum reform with the mess. *Vocational Education Research*, (5), 45–50.
- Chen, X. M. (2000). *Qualitative research methods and social science research*. Educational Science Publishing House.
- Lin, C. D. (2016). *Research on the development of core literacy for students in the 21st century*. Beijing Normal University Press.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32–42.