Interdisciplinary Academic and Research Journal, 5 (4), July-August 2025
Old ISSN 2774-0374: New ISSN 2985-2749
Website: https://so03.tci-thaijo.org/index.php/IARJ/index

Development of Digital Technology Teaching Aerobic Dance Model for University Students in Hunan, The People's Republic of China

Li Zhi[1], Chanchai Siriphan[2] and Suvachai Rittisom[3]
Faculty of Sports Science and Technology, Bangkokthonburi University, Thailand
E-mail: 64869163@qq.com, ORCID ID: https://orcid.org/0009-0006-5591-1460
E-mail: siriphan.cs@gmail.com, ORCID ID: https://orcid.org/0009-0000-9981-655X
E-mail: chaivasu5348@gmail.com, ORCID ID: https://orcid.org/0009-0006-6435-8804
Received 19/04/2025 Revised 10/05/2025 Accepted 15/06/2025

Abstract

Background and Aims: The development of a Digital Technology-Based Aerobic Dance Teaching Model aims to enhance the effectiveness of aerobic dance instruction for university students in Hunan Province, China. Given the rising popularity of aerobic dance and the limitations of traditional classroom-based teaching, this study addresses the need for a flexible, technology-driven model that facilitates learning both inside and outside the classroom. The primary objective is to design, validate, and implement an innovative teaching model that leverages digital technology to optimize aerobic dance learning outcomes.

Methodology: The study employed a multi-phase research design, including questionnaire surveys, expert interviews, and Delphi method validation. The sample comprised 577 participants from four universities in Hunan Province, including both students and instructors. Data collection focused on assessing the current state of aerobic dance education and identifying key elements for model development. The Delphi method involved three iterative rounds with 19 experts, including university deans, professional aerobic coaches, and digital platform specialists, to refine the model's framework. Expert interviews with seven specialists provided qualitative insights to optimize model components. The final model was validated using the Connoisseurship method with seven experts, ensuring practicality and adaptability across diverse learning environments. Statistical analysis included the Item-Objective Congruence (IOC) index for content validity (IOC ≥ 0.75), Cronbach's Alpha for reliability (α > 0.80), and Exploratory Factor Analysis (EFA) to confirm structural validity, with factor loadings exceeding 0.70.

Results: The developed model demonstrated high reliability and structural validity, supporting its application for enhancing aerobic dance education. Key findings include improved teaching effectiveness, greater student engagement, and enhanced learning flexibility. The model's digital platform enables interactive learning, remote practice, and accessible content delivery, effectively overcoming the limitations of traditional classroom-based instruction. Statistical analysis

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confirmed the model's robust design, showcasing high internal consistency and validated components.

Conclusion: The Digital Technology-Based Aerobic Dance Teaching Model provides an innovative framework for aerobic dance education at universities in Hunan. Its technology-driven design facilitates flexible learning and improves student outcomes. The model is practical, adaptable, and scalable, offering a sustainable solution for modernizing physical education while expanding learning opportunities beyond traditional classroom settings.

Keywords: Development of Computer Platform Format; Physical Education; Aerobic Sports

Introduction

The rise of digital technology has profoundly transformed educational practices worldwide, particularly in the domain of physical education. In recent years, aerobic dance has become increasingly popular due to its benefits in promoting cardiovascular health, improving motor skills, and enhancing physical fitness (Li, Zhai, Li, & Peng, 2024). However, traditional methods of teaching aerobic dance in classroom settings present limitations, such as restricted practice time, lack of personalized instruction, and inconsistent feedback. These challenges are especially evident in university settings in Hunan Province, China, where large class sizes and limited facilities hinder the effectiveness of aerobic dance training. Hence, the development of a Digital Technology-Based Aerobic Dance Teaching Model is proposed to address these limitations and enhance learning outcomes.

Digital platforms allow for interactive learning experiences, enabling students to practice aerobic dance techniques beyond the physical classroom environment. Research indicates that technology-enhanced physical education not only improves skill acquisition but also increases student motivation and engagement (Garcia et al., 2023; Yang & Perey, 2023). Moreover, the integration of multimedia instructional tools has been shown to facilitate better understanding of complex movements, provide instant feedback, and enable repeated practice at the learner's own pace (Irfannuddin et al., 2021).

The primary objective of this study is to design, validate, and implement an innovative teaching model that leverages digital technology to optimize aerobic dance learning for university students in Hunan Province. Specifically, the model aims to enhance teaching effectiveness, increase student participation, and improve learning flexibility by incorporating real-time feedback, multimedia content, and self-paced learning modules.

This research is significant for multiple reasons. Firstly, it addresses the gap in digitalized physical education in China, which is still predominantly traditional (Ge, 2021). Secondly, it offers a scalable solution that can be expanded to other regions, potentially modernizing aerobic dance

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education nationwide (Bao, 2020). Finally, the model serves as a framework for integrating digital technology into physical education, contributing to the modernization of sports teaching methodologies (Singh, Steele, & Singh, 2021).

The findings of this research are expected to benefit educators, students, and policymakers by providing an evidence-based framework for technology-driven physical education. This model not only enhances learning outcomes but also aligns with the global shift towards digital learning environments (American College of Sports Medicine, 2021).

In conclusion, the development of the Digital Technology-Based Aerobic Dance Teaching Model represents a strategic approach to modernizing physical education in Hunan's universities. It promises to bridge the gap between traditional teaching methods and modern technology, fostering improved learning experiences and greater accessibility for all students.

Objectives

1. To investigate the effectiveness of the Digital Technology-Based Aerobic Dance Teaching Model in improving aerobic dance skills and learning outcomes among university students in Hunan Province.

2. To compare students' performance and engagement in aerobic dance before and after the implementation of the Digital Technology-Based Aerobic Dance Teaching Model.

3. To develop and validate digital tools and instructional materials that support effective aerobic dance teaching through technology-driven platforms.

4. To assess the scalability and adaptability of the teaching model for broader applications in physical education settings.

Literature Review

Integration of Digital Technology in Physical Education

The integration of digital technology in physical education has gained significant attention in recent years, particularly in the context of aerobic dance instruction. Aerobic dance is widely recognized for its benefits in cardiovascular health, physical fitness, and motor skill development (Li, Zhai, Li, & Peng, 2024). However, traditional teaching methods often limit students' learning opportunities due to constraints in practice time and instructor feedback (Garcia et al., 2023). These challenges are particularly prominent in larger classroom settings, such as those found in universities in Hunan Province, China.

Technology-Enhanced Learning Models

To address these limitations, research has increasingly focused on technology-enhanced learning models. One prominent model is the Blended Learning Model, which integrates online

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digital media with traditional face-to-face classroom methods (Singh, Steele, & Singh, 2021). This model supports flexibility in learning, allowing students to practice aerobic dance techniques at their own pace while receiving immediate feedback through digital platforms (Yang & Perey, 2023). Furthermore, the Multimedia Learning Theory proposed by Mayer (2020) highlights that students learn more effectively when both visual and auditory materials are combined, which is particularly relevant in aerobic dance instruction, where movement demonstration is critical.

Technology Acceptance Model (TAM)

Another important theoretical perspective is the Technology Acceptance Model (TAM), which explains how users come to accept and use technology (Davis, 1989). This model is crucial in understanding the willingness of students and instructors to engage with digital platforms for aerobic dance training. Previous studies indicate that perceived usefulness and ease of use are strong predictors of technology adoption in physical education settings (Garcia et al., 2023).

Development of the Digital Technology-Based Aerobic Dance Teaching Model

The development of the Digital Technology-Based Aerobic Dance Teaching Model builds upon these theoretical foundations by integrating interactive learning experiences with real-time feedback. It bridges the gap between classroom-based learning and independent practice, enhancing both student engagement and learning outcomes. This model is designed to be scalable and adaptable, addressing the needs of diverse learning environments and contributing to the modernization of physical education.

Summary of Literature Findings

In summary, the literature supports the potential of digital technology to enhance physical education by overcoming the limitations of traditional methods. The Digital Technology-Based Aerobic Dance Teaching Model is positioned to leverage these technological advancements, contributing to the modernization of aerobic dance education in higher education settings.

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Conceptual Framework

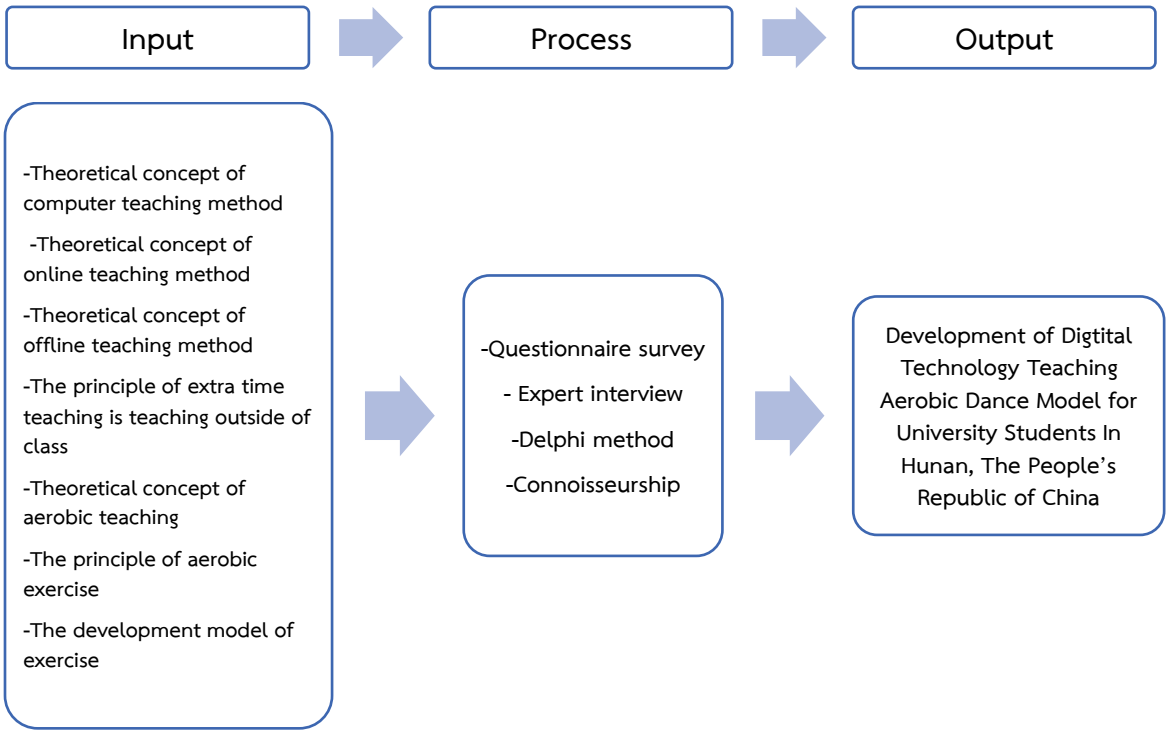

Figure 1 Conceptual framework of the study

Methodology

This study employed a structured multi-phase research design to develop and validate the Digital Technology-Based Aerobic Dance Teaching Model. The research process involved comprehensive data collection, model development, expert validation, and statistical analysis to ensure the reliability and applicability of the model.

Population and Sample Group

The target population for this study consisted of 577 participants from four universities in Hunan Province, China. This group included both students and instructors who were involved in aerobic dance activities. The sample was selected using purposive sampling, focusing on individuals with experience in aerobic dance and familiarity with digital learning platforms.

Research Instruments

The primary instruments used in this study included:

1. Digital Technology-Based Aerobic Dance Teaching Model. A digital platform designed to facilitate aerobic dance instruction through interactive multimedia modules.

2. Questionnaire Surveys to collect quantitative data on student engagement, learning outcomes, and satisfaction levels.

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3. Expert Interview Guides structured interview questions aimed at gathering insights on the model's design and application.

4. Observation Checklists used during practical applications to assess student participation and engagement.

Development and Validation of Research Tools

The development of the research tools followed a rigorous validation process:

1. Item-Objective Congruence (IOC) was conducted with five experts to evaluate content validity, achieving an IOC score of ≥ 0.75.

2. Delphi Method: three iterative rounds with 19 experts, including university deans, aerobic coaches, and digital platform specialists, were used to refine the model's framework.

3. Connoisseurship Method conducted with 7 specialists to validate the practical application and adaptability of the model.

4. Cronbach's Alpha was calculated to measure reliability, resulting in $\alpha = 0.82$, indicating high internal consistency.

Data Collection Procedures

Data collection was carried out over 12 weeks and included:

1. Survey Administration: Distribution of questionnaires to students and instructors to collect data on engagement and learning outcomes.

2. Expert Interviews: Conducted with specialists to gather qualitative insights.

3. Classroom Observations: Instructors monitored student participation during aerobic dance sessions to evaluate practical engagement.

4. Digital Platform Usage Logs: Data were collected on student interaction with the platform, including time spent, module completion, and feedback sessions.

Data Analysis Techniques

The collected data were analyzed using:

1. Descriptive Statistics to summarize the level of student engagement and learning outcomes.

2. Exploratory Factor Analysis (EFA) to confirm the structural validity of the teaching model.

3. Item-Objective Congruence (IOC) to measure content validity.

4. Cronbach's Alpha for reliability analysis.

5. Thematic Analysis to interpret qualitative data from expert interviews and classroom observations.

Ethical Considerations

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Ethical standards were strictly followed throughout the study. Participants were informed of their rights, the purpose of the research, and data confidentiality measures. Consent was obtained before participation, and data were anonymized to ensure privacy.

This structured methodology provided a robust foundation for the development and implementation of the Digital Technology-Based Aerobic Dance Teaching Model, ensuring its reliability, adaptability, and effectiveness in enhancing aerobic dance instruction in university settings.

Results

1. Management development with an IT system, the budget must be sufficient, the curriculum is appropriate, online part-time teaching policy via computer platform, monitoring, and evaluation.

2. Organizational management and teaching practice, development of modern teaching models, facilities, and equipment are complete, teaching place, sound system, and lighting are sufficient.

3. Information technology, teachers and students understand the online system via a computer platform, development of teaching with an IT system.

4. Measurement and evaluation must be accurate and precise. Learning and evaluation of learners must be measured and studied by themselves according to the criteria set by the criteria always set through the computer platform.

5. The development of computer platform potential includes developing teachers, learners, and self-measurement. The components developed are management of learning, self-measurement, development of aerobic dance moves, development of curriculum, program, and evaluation form.

From the content of all 5 components of the developed digital technology teaching aerobic dance model for university students. The researcher has created a model as shown in Figure 2.

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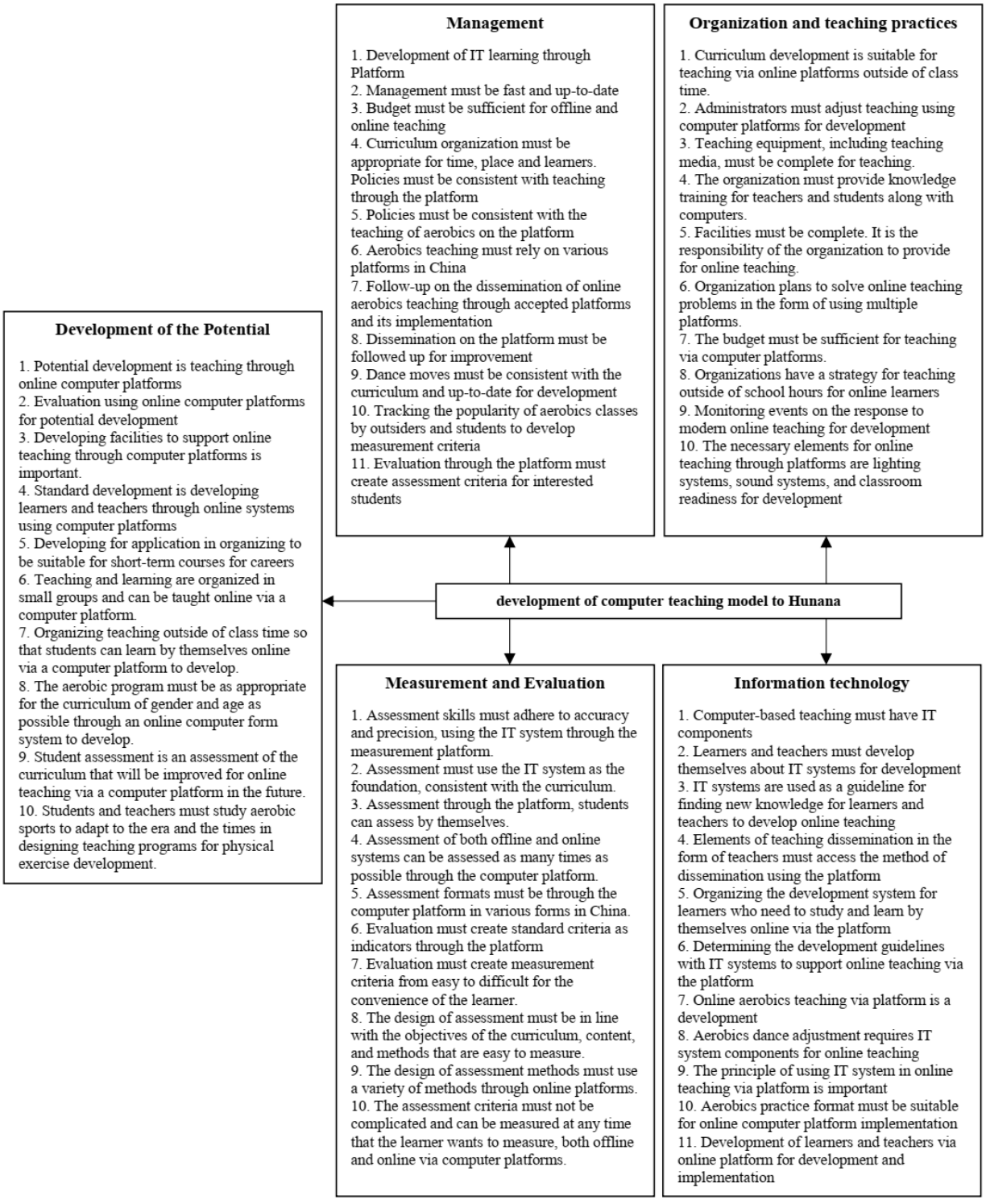

Figure 2 Content of all 5 components of the developed digital technology teaching aerobic dance model for university students

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Discussion

The development of the Digital Technology-Based Aerobic Dance Teaching Model demonstrates a significant advancement in modernizing aerobic dance instruction through technology. The integration of digital platforms for learning aligns with existing research on blended and hybrid learning models, which emphasize flexibility, real-time feedback, and interactive learning modules. Almckhafia (2016) highlighted the importance of IT-based teaching combined with traditional classroom strengths, such as well-managed space, lighting, and sound, to enhance learning experiences. Consistent with this approach, the Digital Technology-Based Aerobic Dance Teaching Model incorporates short, on-demand videos and interactive multimedia that allow students to engage with learning materials both synchronously and asynchronously. This flexible access to content ensures that students can practice dance movements outside of the traditional classroom setting, extending learning opportunities and reinforcing skills through repetition and self-paced study.

The effectiveness of this blended learning model is further supported by research from Ge Ying (2021), who demonstrated that well-structured multi-platform aerobics courses achieved over 85% in both course completion and student satisfaction. This was achieved by effectively managing eight interconnected elements: teachers, learners, content, media, learning steps, two-way communication, tech support, and assessment. The model developed in this study similarly integrates these elements, allowing for seamless interaction between instructors and students, real-time feedback, and digital assessment through the platform. This approach not only maximizes student engagement but also enhances learning outcomes by providing immediate corrections and allowing students to self-monitor their progress.

Furthermore, the study's findings resonate with Bao (2020), who identified five critical strategies: clear goals, micro-lectures, rapid support, active tasks, and backup plans that are crucial for maintaining stability and learning continuity during unexpected disruptions, such as campus lockdowns. The Digital Technology-Based Aerobic Dance Teaching Model incorporates these principles by providing structured learning paths and interactive digital modules that are accessible at any time, supporting continuity even when traditional face-to-face instruction is disrupted.

The model's hybrid nature also addresses the concerns highlighted by Bhardwaj et al. (2021), whose study of Indian medical students revealed that approximately 50% still prefer face-to-face learning environments. The model developed in this research accommodates this need by offering a flexible blend of digital and in-person learning experiences, ensuring that students who benefit from physical presence and direct instructor guidance are not left behind. This dual approach is consistent with Rice and Barbour (2021), who found that explicit recognition of each

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learner during virtual sessions, such as addressing them by name, significantly increases attendance and assignment submission rates. The digital platform used in the aerobic dance model leverages this principle by enabling interactive feedback and personalized attention, even in a virtual setting.

Singh et al. (2021) further support the model's design through their analysis of hybrid learning programs, which concluded that unlimited quiz retakes and alternating in-person coaching with online practice best sustain motivation and learning equity. These elements are fully integrated into the Digital Technology-Based Aerobic Dance Teaching Model, enhancing student engagement and allowing for consistent skill improvement through iterative learning and feedback loops.

In summary, the Digital Technology-Based Aerobic Dance Teaching Model effectively combines the strengths of digital technology with traditional instructional methods to create a dynamic, flexible, and interactive learning environment. The findings from this study, along with supportive evidence from related research, suggest that the model not only meets the demands of modern physical education but also addresses the limitations of conventional classroom-based instruction. Moving forward, considerations for technology access, instructor training, and resource allocation will be essential to ensure sustainable implementation and scalability of this innovative teaching approach.

Conclusion

The Digital Technology-Based Aerobic Dance Teaching Model effectively enhances student engagement, learning flexibility, and performance in aerobic dance education. This model modernizes traditional teaching by integrating digital platforms, real-time feedback, and interactive learning, making it scalable and adaptable for university settings.

For policymakers, supporting technological integration in physical education can bridge gaps between theory and practice, providing students with flexible learning opportunities. For university administrators, investing in IT infrastructure and digital platforms enhances resource efficiency and reduces classroom dependency. Finally, for instructors, the model supports structured and flexible teaching, enabling better monitoring of student progress and adaptive teaching methods.

The model's success in Hunan's universities suggests its potential for broader application in other educational settings. Future research should explore its effectiveness in diverse contexts to confirm its scalability and adaptability.

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Recommendation

Suggestions from this Research

1. Policymakers should consider integrating digital technology into physical education curricula to enhance learning outcomes and engagement. Investment in digital learning platforms can bridge the gap between theoretical instruction and practical application.

2. University administrators are encouraged to adopt the Digital Technology-Based Aerobic Dance Teaching Model to improve student learning and resource efficiency. Blended learning platforms provide flexible learning opportunities while optimizing resource use.

Suggestions for Future Research

1. Future studies should explore the application of the Digital Technology-Based Aerobic Dance Teaching Model in different educational contexts, including secondary schools and community learning centers.

2. Comparative research is recommended to evaluate the effectiveness of this digital teaching model against traditional face-to-face methods in physical education.

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