International Journal of Innovative Research and Scientific Studies, 8(4) 2025, pages: 1152-1160

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

The impact of artificial intelligence-assisted teaching on enhancing physical education quality in secondary vocational schools

Zhanghua Wu[1], Rawi Buaduang[2], Alan Robert White[2], Tubagus Darodjat[2], Supot Rattanapun[2*]

[1,2]*International College, Rajamangala University of Technology Krungthep, Thailand.*

Corresponding author: Supot Rattanapun (*Email: supot.r@mail.rmutk.ac.th*)

Abstract

This study investigates the effects of the sports prescription teaching model and artificial intelligence (AI)-assisted teaching on the intelligent teaching process and the overall quality of physical education (PE) instruction in secondary vocational schools. It further examines the mediating role of the intelligent teaching process in enhancing teaching outcomes. A quantitative research design was employed, with data collected from 414 students across five secondary vocational schools in Nanning, China. The study used descriptive statistics, validity and reliability testing, correlation analysis, and multiple regression analysis to examine the relationships among key variables: sports prescription teaching, AI-assisted teaching, intelligent teaching processes, and PE teaching quality. The intelligent teaching process significantly enhanced PE teaching quality, particularly in personalized training (M = 4.35), skill acquisition (M = 4.33), and classroom interaction and enjoyment (M = 4.31). Key statistical findings include: (1) the sports prescription teaching model significantly predicted intelligent teaching ($\beta = 0.893$, $R^2 = 0.798$); (2) AI-assisted teaching had a strong positive effect on intelligent teaching ($\beta = 0.900$, $R^2 = 0.810$); (3) the intelligent teaching process significantly mediated the influence of both teaching models on teaching quality ($\beta = 0.880$, $R^2 = 0.798$); (4) intelligent teaching enhanced the effectiveness of the sports prescription model ($\beta = 0.866$, $R^2 = 0.806$); (5) and it amplified the impact of AI-assisted teaching ($\beta = 0.874$, $R^2 = 0.810$). The intelligent teaching process serves as a crucial mediating factor that enhances the effectiveness of both the sports prescription teaching model and AI-assisted teaching in vocational physical education settings. These findings support the integration of AI technologies and evidence-based instructional models such as sports prescriptions into vocational education. Educators and policymakers are encouraged to adopt intelligent teaching strategies to foster personalized, engaging, and health-promoting PE experiences that improve learning outcomes for vocational students.

Keywords: AI-Assisted teaching, Intelligent teaching process, Sports prescription Teaching model, Teaching quality.

DOI: 10.53894/ijirss.v8i4.8019
Funding: This study received no specific financial support.
History: Received: 1 May 2025 / **Revised:** 6 June 2025 / **Accepted:** 10 June 2025 / **Published:** 23 June 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Acknowledgment: The authors would like to express their sincere gratitude to the International College, Rajamangala University of Technology Krungthep, Thailand, for providing academic support and resources throughout the research process. Special thanks are extended to all participating secondary vocational schools, teachers, and students who contributed valuable data and insights to this study. The authors also appreciate the constructive feedback provided by peer reviewers, which greatly enhanced the quality of this research.
Publisher: Innovative Research Publishing

1. Introduction

In recent years, the integration of intelligent technologies into physical education (PE) has become a critical focus of educational reform, driven by the increasing demand for personalized, efficient, and data-informed instruction. This shift aligns with Tyler's curriculum development theory [1], which emphasizes a systematic, goal-oriented approach to curriculum design. Complementing this, Personalized Learning Theory [2] and Ausubel's Meaningful Learning Theory [3]. Underscore the significance of individualized learning pathways, adaptive feedback, and the cognitive connection between new content and prior knowledge. Together, these pedagogical foundations support the emergence of intelligent teaching processes (ITP), technology-enhanced instructional approaches that leverage wearable devices, big data analytics, and artificial intelligence (AI) algorithms to enhance student engagement, instructional precision, and educational outcomes [4-6].

As part of China's national strategy to strengthen education and reform PE, the integration of digital and AI technologies is reshaping traditional sports teaching models. Despite improvements in adolescents' nutrition and developmental indicators, a continued decline in students' physical fitness, particularly among vocational school students, has been observed, marked by rising rates of overweight, obesity, and vision impairment [7, 8]. These issues stem, in part, from outdated, teacher-centered PE methods that lack innovation and fail to accommodate individual student differences [9].

To address these concerns, the Chinese government has accelerated the development of sports informatization and emphasized the application of intelligent teaching resources. In particular, the sports prescription teaching model, when integrated with AI-assisted instruction and supported by technologies such as virtual and augmented reality, offers promising avenues to improve PE by enhancing interactivity, personalizing learning, overcoming resource constraints, and supporting students' physical health and overall learning outcomes.

However, despite the progress made by China's national intelligent education platform, especially in core vocational subjects, the development of resources for physical education remains limited. In secondary vocational schools in Nanning, Guangxi, the adoption of intelligent PE tools and technologies is only beginning. While some institutions have started using digital equipment, overall implementation remains low. Significant disparities exist in teachers' digital competencies, and concerns are growing about students' dependence on technology [10].

Although the integration of AI and sports prescription models has demonstrated potential in various educational settings, their practical application within the unique context of secondary vocational schools in China remains underexplored. Current PE programs often lack personalization, interactivity, and innovative factors that are crucial for improving physical health and educational quality among vocational students.

Prior studies have predominantly focused on general education or higher education contexts [11, 12] with limited empirical research addressing how AI and sports prescription models function in the vocational education system, particularly at the secondary level. Furthermore, while the benefits of AI and sports prescriptions have been individually studied, the mediating role of intelligent teaching processes between these instructional models and teaching quality is still not well understood.

1.1. Objectives

This study aims to address these gaps by:

1. Investigating the implementation status of sports prescription teaching and intelligent teaching processes in secondary vocational schools in Nanning.
2. Examining the impact of AI-assisted teaching on the development of intelligent teaching processes.
3. Analyzing the mediating role of intelligent teaching processes between sports prescription / AI-assisted teaching and the quality of PE instruction.

1.2. Research Questions

1. To what extent are sports prescription and AI-assisted teaching models being implemented in secondary vocational PE programs in Nanning?
2. How do AI-assisted teaching models influence the development of intelligent teaching processes?
3. Does the intelligent teaching process mediate the relationship between instructional models (sports prescription, AI-assisted teaching) and PE teaching quality?

2. Literature Review

The integration of intelligent technologies in physical education (PE) has emerged as a focal point in educational innovation, aiming to provide personalized, efficient, and data-driven instruction. This direction aligns with Tyler's curriculum development, which Keefe's personalized [2] meaningful learning the [3] empty

Building on these foundations, intelligent teaching processes (ITP) have gained momentum. These processes leverage wearable technology, AI algorithms, and big data analytics to improve student engagement and instructional precision [4-6].

Such systems offer real-time feedback, adaptive task difficulty, and personalized content delivery, which have been shown to enhance both learning effectiveness and physical fitness [13, 14].

Parallel to this, the sports prescription teaching model has demonstrated promise in customizing PE based on individual physiological indicators such as VO_2max and heart rate [15, 16]. Studies confirm that individualized training programs contribute to improved student outcomes in physical fitness and motivation [17].

Moreover, AI-assisted teaching has transformed traditional instructional approaches by enabling smart assessments, virtual coaching, and intelligent learning management systems [18, 19]. These innovations promote interactivity and autonomy while enhancing student performance [20, 21].

Despite these advancements, challenges remain. National reports indicate declining physical fitness among Chinese adolescents, especially in vocational schools, attributed to rigid, teacher-centered instruction and a lack of innovation [7, 8]. In response, policy frameworks now advocate for increased sports informatization and the use of intelligent digital resources [22].

However, implementation varies significantly. Research points to gaps in teacher readiness, unequal access to digital tools, and concerns about overdependence on devices [23]. Although national platforms support core vocational subjects, resources for physical education remain insufficient, especially in underserved areas like Nanning, Guangxi [24].

Internationally, most studies have emphasized digital PE in higher education or general academic settings, while research in secondary vocational schools remains limited [11, 25]. The vocational education context presents unique challenges that require tailored pedagogical and technological solutions.

In sum, the literature demonstrates the potential of integrating AI and sports prescription teaching in PE. However, empirical, context-specific research is lacking, particularly within secondary vocational schools in China. This study aims to fill that gap by exploring how these innovations affect PE quality in this educational context.

3. Materials and Methods

3.1. Study Participants

A total of 414 valid questionnaires were collected from secondary vocational school teachers and students in Nanning, Guangxi, China. Participants were selected using purposive sampling to ensure representation across different school types and characteristics. Baseline demographic data included gender, age, identity (teacher or student), school type (public or private), and school nature (comprehensive or specialized). In addition to the survey, semi-structured interviews were conducted with six school administrators responsible for physical education to gather in-depth qualitative insights.

3.2. Research Design

This study adopted a mixed-methods research design to investigate the application of the Sports Prescription Teaching Model (SPTM) and Artificial Intelligence-assisted Teaching (AIT) in physical education. Specifically, the study explored the mediating role of the Intelligent Teaching Process (ITP) in enhancing Physical Education Teaching Quality (PETQ). Quantitative data were gathered via structured questionnaires, while qualitative insights were derived from interviews. The four core variables examined were SPTM, AIT, ITP, and PETQ.

3.3. Instrumentation

The survey instrument was developed based on prior literature and expert consultations in sports education and educational technology. Each construct included multiple items measured on a 5-point Likert scale. The internal consistency of the scales was assessed using Cronbach's alpha coefficients, which demonstrated high reliability: SPTM ($\alpha = 0.922$), AIT ($\alpha = 0.950$), ITP ($\alpha = 0.903$), and PETQ ($\alpha = 0.918$). These results indicate strong inter-item correlations, confirming that each dimension reliably measures the intended construct.

3.4. Data Analysis

The data analysis in this study employed a mixed-methods approach, combining quantitative and qualitative techniques to comprehensively examine the impact of the "sports prescription + AI smart sports" teaching model on physical education quality. Quantitative analysis included descriptive statistics to outline demographic characteristics, Pearson correlation to assess relationships among key variables, and multiple regression to determine the predictive power of sports prescription teaching, AI-assisted instruction, and intelligent teaching processes on teaching quality. Additionally, hypothesis testing confirmed the mediating role of intelligent teaching in enhancing outcomes. Qualitative insights from open-ended responses enriched the findings by highlighting students' preferences, emotional needs, and suggestions for improving intelligent PE instruction.

3.5. Analytical Approach and Novelty

This study employed a mixed-methods approach, combining quantitative analysis (via structured questionnaires and statistical modeling) with qualitative analysis (through semi-structured interviews and open-ended responses). Core statistical methods included descriptive statistics, Pearson correlation analysis, and multiple regression analysis, which were used to examine relationships among four primary constructs: the Sports Prescription Teaching Model (SPTM), AI-assisted Teaching (AIT), the Intelligent Teaching Process (ITP), and Physical Education Teaching Quality (PETQ). In addition, mediation analysis was conducted to determine whether ITP serves as a linking mechanism between instructional models and educational outcomes.

Compared to prior studies, which often relied solely on descriptive or correlational methods, this study introduced a multivariate regression framework that explicitly tested causal pathways and mediating effects. While earlier research typically treated AI or sports prescription teaching as isolated innovations, this study uniquely integrates both within a unified analytical model and explores how intelligent teaching acts as a mediator, a dimension underexplored in existing literature. Moreover, by incorporating both teacher and student perspectives and enriching the dataset with qualitative insights from administrators, this research provides a multi-actor, system-level view of the educational ecosystem in vocational school physical education, a notable departure from the more narrow or theory-only approaches seen in earlier work.

4. Results

Table 1.
Demographic Characteristics of Respondents (N=414).

Name	Options	Frequency	Percentage	Percentage	Cumulative percentage
Grade	Secondary vocational school first grade	293	70.8	70.8	70.8
	Secondary vocational school, Grade 2	121	29.2	29.2	100
School	Guangxi Police School	46	11.1	11.1	11.1
	Guangxi Materials School	39	9.4	9.4	20.5
	Guangxi Polytechnic Vocational Technical School	204	49.3	49.3	69.8
	Guangxi Overseas Chinese School	84	20.3	20.3	90.1
	Nanning No.4 Vocational and Technical School	41	9.9	9.9	100
Gender	Female	162	39.1	39.1	39.1
	Male	252	60.9	60.9	100
sports Frequency	0	15	3.6	3.6	3.6
	1-2	156	37.7	37.7	41.3
	3-4	111	26.8	26.8	68.1
	5	132	31.9	31.9	100
Smart Devices	Not used	6	1.4	1.4	1.4
	Used	408	98.6	98.6	100

Table 1 presents the demographic characteristics of the respondents. The majority of participants (70.8%) were first-year students at secondary vocational schools, with the highest proportion (49.3%) enrolled at Guangxi Polytechnic Vocational and Technical College. Regarding gender, 60.9% of the respondents were male, while 39.1% were female.

In terms of engagement in physical activity, most students reported participating in sports activities at least once or twice per week (37.7%). However, a small proportion (3.6%) indicated that they did not engage in any sports activities. Notably, a vast majority of the respondents (98.6%) reported having used smart bracelets or sports applications, suggesting a high level of technological adoption related to physical health monitoring among the students.

Table 2
Correlation analysis of sports prescription teaching model, artificial intelligence-assisted teaching, intelligent teaching process, and physical education teaching quality.

Variables	SPTM	AIT	ITP	PETQ
Sports prescription teaching model (SPTM)	1			
Artificial intelligence-assisted teaching (AIT)	0.915**	1		
Intelligent teaching process (ITP)	0.893**	0.900**	1	
Physical education teaching quality (PETQ)	0.866**	0.874**	0.880**	1

Note: ** Correlation is significant at the 0.01 level (two-tailed)

Table 2 illustrates the results of a correlation analysis among four key variables: the sports prescription teaching model (SPTM), artificial intelligence-assisted teaching (AIT), intelligent teaching process (ITP), and physical education teaching quality (PETQ). The findings demonstrate that all variables are significantly and positively correlated at the 0.01 level (two-tailed).

Specifically, SPTM shows a strong positive correlation with AIT ($r = 0.915$, $p < 0.01$), indicating that the implementation of AI-assisted methods is closely associated with the sports prescription teaching approach. SPTM is also significantly correlated with ITP ($r = 0.893$, $p < 0.01$) and PETQ ($r = 0.866$, $p < 0.01$), suggesting that the sports prescription model enhances both the instructional process and perceived teaching quality.

Furthermore, AIT correlates strongly with ITP (r = 0.900, p < 0.01) and PETQ (r = 0.874, p < 0.01), reflecting the impact of AI in facilitating intelligent instruction and improving teaching outcomes. Lastly, ITP is highly correlated with PETQ (r = 0.880, p < 0.01), which reinforces the idea that a well-structured, intelligent teaching process plays a critical role in elevating physical education quality.

Overall, the results suggest that each component of sports prescription models, AI integration, and intelligent teaching processes contributes significantly to the enhancement of teaching quality in physical education contexts.

Table 3.
Results of linear regression analysis of the sports prescription teaching model, artificial intelligence teaching, intelligent teaching process and physical education teaching quality variables.

Variables	Unstandardized coefficients		Standardized coefficient	t	p	Collinearity diagnostics	
	B	Standard error	Beta			VIF	Tolerance
Constant	0.397	0.097	-	4.086	0.000**	-	-
SPTM	0.388	0.047	0.395	8.179	0.000**	4.943	0.202
AIT	0.407	0.047	0.43	8.715	0.000**	5.27	0.19
ITP	0.529	0.048	0.528	10.935	0.000**	4.943	0.202
R2	0.806						
Adjustment R 2	0.805						
F	F (2,411)=855.669, p=0.000						
D-W value	1.888						
Remark:(SPM AIT) ITP = PETQ							

Note: * p<0.05 ** p<0.01.

Table 3 presents the results of a multiple regression analysis examining the effects of the sports prescription teaching model (SPTM), artificial intelligence teaching (AIT), and the intelligent teaching process (ITP) on physical education teaching quality (PETQ). The findings indicate that all three predictors have a statistically significant positive impact on PETQ at the 0.01 confidence level (p = 0.000).

Among the predictors, the intelligent teaching process exhibited the greatest influence (standardized coefficient β = 0.528), followed by artificial intelligence teaching (β = 0.430), and the sports prescription teaching model (β = 0.395). These results suggest that the integration of intelligent pedagogical strategies plays a more prominent role in enhancing teaching outcomes compared to traditional or AI-assisted approaches alone.

The regression model demonstrated a high level of explanatory power, with an R^2 value of 0.806 and an adjusted R^2 of 0.805. The F-statistic was 855.669, indicating that the overall model is statistically significant. Additionally, the Durbin-Watson statistic was 1.888, suggesting that there is no serious issue of autocorrelation in the residuals.

In summary, the findings support the conclusion that teaching approaches incorporating intelligent technology substantially contribute to improving the quality of physical education instruction in secondary vocational schools.

Table 4.
Hypothesis Results Testing.

Hypothesis	Path	Coefficient	R	P	F	Result
H1	SPTM—ITP	0.893**	0.798	0.000	1624.394	support
H2	AIT—ITP	0.900**	0.810	0.000	1759.042	support
H3	ATP—PETQ	0.880**	0.775	0.000	1417.683	support
H4	SPTM—ITP—PETQ	0.866**	0.806	0.000	855.669	support
H5	AIT—ITP—PETQ	0.874**	0.810	0.000	875.762	support

Table 4 presents the results of the hypothesis testing. The results are presented as follows.

H_1: The sports prescription teaching model (SPTM) has a significant positive impact on the intelligent teaching process (ITP). The path coefficient from SPTM to ITP is 0.893, with R = 0.798, F = 1624.394, and p < 0.01, indicating a strong and statistically significant relationship. Therefore, H1 is supported.

H_2: Artificial intelligence-assisted teaching (AIT) has a significant positive effect on the intelligent teaching process. The path coefficient is 0.900, with R = 0.810, F = 1759.042, and p < 0.01, confirming the positive influence of AIT on ITP. Thus, H2 is supported.

H_3: The intelligent teaching process has a significant positive impact on the quality of physical education teaching (PETQ). The path coefficient is 0.880, with R = 0.775, F = 1417.683, and p < 0.01, suggesting that improvements in the intelligent teaching process contribute directly to enhanced teaching quality. Consequently, H3 is supported.

H_4: The intelligent teaching process mediates the relationship between the sports prescription teaching model and physical education teaching quality. The indirect path (SPTM → ITP → PETQ) shows a path coefficient of 0.866, with R = 0.806, F = 855.669, and p < 0.01, indicating a significant mediating effect. Hence, H4 is supported.

H_5: Similarly, the intelligent teaching process mediates the relationship between artificial intelligence teaching and physical education teaching quality. The path coefficient for the indirect effect (AIT → ITP → PETQ) is 0.874, with R = 0.810, F = 875.762, and p < 0.01, supporting the mediating role of ITP. Therefore, H5 is supported.

These results collectively highlight the central role of the intelligent teaching process in enhancing the effectiveness of both sports prescription and AI-assisted teaching methods in improving the quality of physical education in secondary vocational schools.

4.1. Interview Results and Qualitative Insights

An in-depth analysis of the responses to open-ended questions in the student questionnaire revealed valuable qualitative insights regarding the application of the "sports prescription + AI smart sports" teaching model. While students expressed high levels of appreciation for the model's features, particularly its personalized exercise recommendations and real-time feedback, they also highlighted specific expectations and concerns that warrant attention in the future development of intelligent physical education systems.

A prominent theme that emerged was the need for improved technological accuracy as well as humanistic and emotional support within the teaching process. Students indicated that, despite the convenience and intelligence of AI-supported instruction, there remains a strong desire for direct human interaction, particularly in the form of teacher demonstrations, companionship during physical activity, and guidance in skill development.

These findings suggest that the future direction of intelligent physical education should focus on the integration of technology with humanistic pedagogy. Specifically, AI systems must be optimized to better address individual differences among learners, while physical education teachers continue to play an irreplaceable role in emotional support, motivation, and interactive engagement in the classroom.

Furthermore, students emphasized the importance of enhancing the richness, variety, and enjoyment of teaching content to improve classroom engagement and increase their willingness to participate in physical activity. The combination of intelligent tools and teacher-led instruction offers the potential to create a more personalized, interactive, and effective teaching environment, thereby supporting students' holistic development.

In summary, the qualitative data reinforce the conclusion that while AI-based instructional models offer powerful capabilities, their true educational value is maximized when complemented by the human elements of teaching, fostering a more engaging and inclusive learning experience.

5. Discussion

5.1. The Sports Prescription Teaching Model Has a Positive Impact on the Intelligent Teaching Process in Secondary Vocational Schools

It is hypothesized that the sports prescription teaching model has a positive impact on the intelligent teaching process in secondary vocational schools. By promoting personalized instruction, adaptive feedback, and data-driven decision-making, the model aligns well with intelligent systems that utilize AI and big data to optimize learning outcomes. Prior studies [11, 12, 15] confirm that integrating sports prescription with intelligent teaching enhances student engagement, precision teaching, and learning efficiency. Song [26] emphasizes that smart technologies enable the creation of personalized exercise plans, while [27] highlights the use of data thinking and diverse teaching strategies to continuously update educational content. Overall, the literature supports the acceptance of H1, demonstrating that the sports prescription teaching model significantly contributes to the development of an effective and responsive intelligent teaching process in physical education.

5.2. The Impact of Artificial Intelligence-Assisted Teaching on the Intelligent Teaching Process of Physical Education in Secondary Vocational Schools

Artificial intelligence-assisted teaching has a positive impact on the intelligent teaching process of physical education in secondary vocational schools, as it enables real-time data collection, individualized feedback, and scientific monitoring through smart sports equipment and applications. Teachers can analyze students' physical performance data to adjust instruction dynamically, making the teaching process more quantifiable, analyzable, and personalized. Empirical evidence supports this view: Xie [28] demonstrated that AI-assisted tennis training improved students' technical accuracy and learning efficiency; Chen and Meng [29] showed that intelligent devices enhanced student engagement and provided real-time performance feedback in badminton instruction; Liu [30] found that AI systems accelerated movement skill acquisition in aerobics; and Tian [31] highlighted the benefits of 3D simulation in wearable devices for visualizing and correcting student movements. Collectively, these studies affirm H2 that AI-assisted teaching significantly enhances the intelligent teaching process, supporting a more effective and engaging physical education environment in secondary vocational schools.

5.3. Through the Integration of Artificial Intelligence Assisted Teaching and Analysis in the Sports Prescription Teaching Model, the Intelligent Teaching Process Plays a Mediating Role in Improving the Quality of Physical Education.

The integration of artificial intelligence-assisted teaching within the sports prescription teaching model plays a pivotal role in enhancing the quality of physical education. This intelligent teaching process enables a shift from traditional experience-based methods to a data-driven, personalized, and dynamic approach, promoting precision, informatization, and high-quality instruction. By leveraging technologies such as AI, big data, and VR/AR, educators can optimize teaching content, improve classroom interactivity, and provide real-time feedback for skill enhancement. Research highlights how AI supports individualized training plans based on students' physical differences, enhancing both effectiveness and engagement in physical education [32]. Case studies further demonstrate the benefits of intelligent wearables and interactive sports venues

in facilitating immersive, situational learning experiences [33, 34]. Collectively, these advancements underscore the intelligent teaching process as a mediating force in adapting teaching content, optimizing learning paths, and fostering lifelong physical literacy, thereby contributing to the ongoing reform and innovation of physical education curricula [35].

5.4. Assume That the Intelligent Teaching Process Can Improve the Quality of Physical Education in Secondary Vocational Schools through the Sports Prescription Teaching Model.

The sports prescription teaching model can effectively enhance the quality of physical education in secondary vocational schools by integrating intelligent teaching processes. This model focuses on scientific, systematic, and personalized training plans based on students' physiological indicators and fitness levels. The intelligent teaching process enhances the accuracy, efficiency, and adaptability of instruction, promotes fairness in physical education, and supports students in managing their physical health. The combination of AI technologies, such as big data, intelligent platforms, and real-time feedback systems, further strengthens the personalization and scientific foundation of teaching. Li [36] emphasized that the use of Internet technology in physical education improves both engagement and instructional precision, enabling individualized learning and timely feedback. Similarly, Chen et al. [37] highlighted the value of AI in advancing the quality and efficiency of school physical education. As AI technology continues to evolve, the intelligent sports prescription teaching model will play an increasingly significant role in promoting precise, fair, and student-centered physical education in secondary vocational schools.

5.5. The Impact of Artificial Intelligence-Assisted Teaching on Improving the Quality of Physical Education in Secondary Vocational Schools Through Intelligent Teaching Processes.

Artificial intelligence-assisted teaching significantly enhances the quality of physical education by optimizing teaching resource allocation through adaptive recommendation algorithms, constructing accurate learner profiles, and generating personalized learning paths. The intelligent teaching process establishes a bidirectional interactive platform between teachers and students, enabling real-time behavioral perception, cognitive diagnosis, and tiered feedback. Through the deep mining of teaching big data, it forms a closed-loop model of resource adaptation–process regulation–effect evaluation, thus improving teaching efficiency and instructional quality. Wang [38] emphasized that the goal of intelligent sports teaching is to build a "personalized, precise, and intelligent" system, allowing the customization of training plans based on students' physiological characteristics and fitness levels, while smart devices enable real-time monitoring for informed decision-making. Similarly, Zhang [39] highlighted the capacity of AI systems to deliver differentiated instruction and enhance student learning outcomes through appropriate methods tailored to individual needs.

In this context, the sports prescription teaching model plays a vital role in promoting personalized, scientific instruction tailored to students' physical fitness and health conditions. The integration of AI further refines this model by improving the real-time responsiveness and precision of teaching. As a mediating mechanism, the intelligent teaching process connects these two approaches, driving the transformation from experience-based to data-driven education. Song [26] noted that AI-based personalized sports prescriptions increase student participation and learning outcomes, while Xie [28] confirmed that intelligent teaching assistants enhance the efficiency of skill-based instruction, such as tennis.

The findings validate that the sports prescription teaching model, supported by AI-assisted teaching, significantly improves the quality of physical education in secondary vocational schools. It enhances instructional accuracy, feedback efficiency, and student health management. Li [36] emphasized the importance of intelligent platforms under the "Internet+" framework in achieving personalized physical education, and Wang [38] further confirmed the value of real-time adjustments for precise teaching. Therefore, the intelligent teaching process serves as a critical link in realizing a modern, scientific, and intelligent physical education system.

6. Conclusion

This study revealed a significant positive correlation among the sports prescription teaching model, artificial intelligence-assisted teaching, and the intelligent teaching process in improving the quality of physical education. Notably, the intelligent teaching process plays a crucial mediating role in enhancing instructional effectiveness. Regression analysis indicated that the intelligent teaching process had the strongest impact on teaching quality ($\beta = 0.407$), followed by artificial intelligence-assisted teaching ($\beta = 0.293$) and the sports prescription teaching model ($\beta = 0.234$), thereby confirming research hypotheses H1 through H5. These findings support the deep integration of scientific, personalized instructional design with intelligent technologies, offering a new strategic direction and empirical foundation for optimizing physical education in secondary vocational schools. The study provides innovative insights with both theoretical value and practical significance for the advancement of modern physical education.

7. Recommendations

Recommendations for the study's implications:

7.1. Promote Deep Integration of AI in Physical Education

Educational institutions should actively incorporate artificial intelligence technologies such as adaptive learning systems, data analytics, and intelligent feedback platforms into physical education curricula to enhance teaching precision, personalization, and real-time responsiveness.

7.2. Enhance Teacher Training in Digital Competencies

Secondary vocational schools should provide professional development programs that equip physical education teachers with the skills to effectively implement AI-assisted and intelligent teaching tools, ensuring sustainable and meaningful integration.

7.3. Strengthen the Implementation of Sports Prescription Models

Schools should adopt scientifically grounded sports prescription teaching models that consider students' individual physical fitness, health data, and developmental needs, creating customized training plans that support long-term health and performance.

7.4. Establish a Closed-Loop Intelligent Teaching System

Policymakers and school administrators should encourage the construction of closed-loop teaching systems that integrate resource adaptation, process monitoring, and outcome evaluation, thereby continuously refining teaching strategies and improving educational outcomes.

7.5. Invest in Smart Infrastructure and Equipment

To support intelligent teaching processes, schools should invest in smart sports equipment (e.g., wearables, motion tracking sensors) and digital infrastructure that facilitates data collection, monitoring, and real-time feedback during physical activities.

7.6. Encourage Research and Evaluation

Future studies should focus on longitudinal and large-scale evaluations of AI-assisted physical education models to further validate their effectiveness, address technical challenges, and explore scalability across different school contexts.

References

[1] R. W. Taylor, *Basic principles of curriculum and instruction*. Chicago, IL: University of Chicago Press, 1949.

[2] J. W. Keefe, *Learning style theory and practice*. United States: National Association of Secondary School Principals, 1987.

[3] D. P. Ausubel, *The psychology of meaningful verbal learning*. USA: Grune & Stratton, 1963.

[4] P. Shen, "Research on intelligent recommendation of exercise prescriptions for college students' physical health based on machine learning," *Sports Science Research,* vol. 25, no. 4, pp. 54–61, 2021.

[5] Y. Huang, *Research on the innovation of physical education curriculum teaching reform path based on digital technology*. China: People's Education Press, 2023.

[6] J. Peng, "Research on the construction of middle school physical education smart teaching platform based on generative artificial intelligence," *Modern Educational Technology Journal,* vol. 34, no. 2, pp. 88–95, 2024.

[7] Ministry of Education of China, *National student physical fitness report 2020*. Beijing: Educational Press, 2020.

[8] General Administration of Sport of China, *Notice of the general administration of sport on the issuance*. Beijing, China: 14th Five-Year Plan for Sports Development, 2021.

[9] X. Wu, "Dilemma and countermeasures for improving teaching ability of secondary vocational physical education teachers in the new era," *Vocational Technology,* vol. 8, no. 3, pp. 55–68, 2025.

[10] Z. Yin, H. Liu, and W. Zhang, "Framework construction and promotion strategy for integrating artificial intelligence into interdisciplinary theme teaching of sports and health," *Journal of Educational Technology Development,* vol. 15, no. 1, pp. 88–95, 2024.

[11] P. Zhang and M. Li, "Research on the integration of sports prescription and intelligent education models," *Education and Information Technologies,* vol. 27, no. 6, pp. 7895–7912, 2022.

[12] J. Wang, H. Zhao, and L. Xu, "Intelligent teaching in physical education based on sports prescription: A new approach," *International Journal of Emerging Technologies in Learning,* vol. 18, no. 7, pp. 45–52, 2023.

[13] A. Chen, "Real-time feedback systems in PE," *Educational Innovations in Sports,* vol. 12, no. 2, pp. 88–94, 2024.

[14] Z. Yao and Q. Feng, "Remote instruction and AI in fitness training," *Technology and Sports,* vol. 10, no. 1, pp. 60–66, 2024.

[15] Y. Liu and T. Chen, "VO_2max-based sports prescriptions for adolescents," *China Journal of School Health,* vol. 42, no. 6, pp. 513–517, 2022.

[16] M. Zhang, "Adaptive PE instruction using physiological indicators," *Journal of Educational Research and Development,* vol. 21, no. 5, pp. 101–108, 2024.

[17] L. Gao and Y. Zhou, "Motivation-driven PE planning via sports prescription," *Asian Journal of Physical Education,* vol. 18, no. 2, pp. 22–28, 2024.

[18] X. Yin, "Artificial intelligence in vocational PE," *International Journal of PE Innovation,* vol. 9, no. 3, pp. 35–42, 2023.

[19] A. Chen, "Smart assessment tools for PE," *Educational Technology Frontier,* vol. 15, no. 2, pp. 77–83, 2024.

[20] B. Qian, "Virtual reality and gamified PE systems," *Physical Education and Sport Pedagogy,* vol. 30, no. 1, pp. 12–19, 2025.

[21] T. Wu, "Limitations of traditional PE in vocational schools," *Journal of Vocational Education Studies,* vol. 13, no. 2, pp. 44–50, 2025.

[22] K. Rattanapun, "Digital transformation in sports education," *Journal of Global Sport Management,* vol. 7, no. 4, pp. 300–312, 2021.

[23] X. Yin, "Barriers to intelligent PE adoption in vocational schools," *Technology and Education Review,* vol. 11, no. 3, pp. 65–71, 2024.

[24] H. Menghan and K. Rattanapun, "Intelligent teaching platforms in Chinese vocational education," *Asian Education Review,* vol. 26, no. 1, pp. 33–39, 2024.

[25] L. Wang, Q. Zhang, and J. Liu, "AI integration in university PE courses," *International Journal of Sports Science and Coaching,* vol. 18, no. 2, pp. 142–150, 2023.

[26] W. Song, "Application of smart technologies in personalized exercise prescription," *Journal of Intelligent Physical Education Systems,* vol. 12, no. 3, pp. 45–52, 2024.
[27] D. Chen, "Data thinking and diverse teaching strategies in physical education," in *Proceedings of the 2023 International Conference on Smart Education and Physical Training*, 2023, pp. 87–93.
[28] B. Xie, "Impact of AI-assisted tennis training on technical accuracy and learning efficiency in physical education," *Journal of Sports Science and Intelligent Education,* vol. 15, no. 1, pp. 34–41, 2024.
[29] D. Chen and S. Meng, "The role of intelligent devices in enhancing engagement and feedback in badminton instruction," *Proceedings of the 2022 International Symposium on Smart Physical Education,* pp. 76–82, 2022.
[30] C. Liu, "Accelerating aerobics skill acquisition using AI systems," *Journal of Artificial Intelligence in Education,* vol. 18, no. 4, pp. 59–65, 2023.
[31] X. Tian, "Application of 3D simulation in wearable devices for movement correction in physical education," *IEEE Transactions on Learning Technologies,* vol. 17, no. 2, pp. 112–118, 2024.
[32] C. Xing, "Design and construction of exercise prescription teaching mode in school physical education curriculum," *Chinese Journal of School Health*, vol. 42, no. 9, pp. 1288-1292, 2021.
[33] Z. Zhang and X. Huang, "Application scenarios and key technical issues of artificial intelligence to promote the digital transformation of school sports," *Applied and Computational Engineering*, vol. 146, pp. 133–140, 2025.
[34] T. Chen, "A study on strategies for improving the quality of physical education teaching in primary schools using information technology," *Journal of Primary Education Research,* vol. 38, no. 1, pp. 88–94, 2024.
[35] Z. Huang, L. Wang, and Y. Zhang, "Reforming physical education curricula through intelligent teaching systems: A pathway to lifelong physical literacy," *International Journal of Smart Education and Sports Science,* vol. 11, no. 3, pp. 102–110, 2023.
[36] Y. Li, "Application of intelligent platforms in personalized physical education under the 'Internet+' framework," *Journal of Intelligent Education and Technology Integration,* vol. 10, no. 4, pp. 89–95, 2023.
[37] T. Chen, J. Liu, and Q. Wang, "Research on the innovation of teaching reform paths of physical education courses based on digital technology " *Journal of Contemporary Physical Education Research,* vol. 15, no. 2, pp. 33–40, 2024.
[38] L. Wang, "Construction of personalized and intelligent sports teaching systems based on smart monitoring technologies," *Journal of Digital Physical Education Innovation,* vol. 9, no. 1, pp. 25–32, 2024.
[39] X. Zhang, "Application of artificial intelligence in differentiated instruction for physical education," *International Journal of Smart Learning Environments,* vol. 12, no. 2, pp. 58–65, 2024.