ingegneria sismica
International Journal of Earthquake Engineering
Anno XLIII - Num. 2 - 2026

Optimization of the mode of project-based teaching of physical education courses in higher vocational colleges and universities based on artificial intelligence in the perspective of big ideology and politics

Yunfan Zhang[1,*] *and Lingjuan Deng*[1]

[1] School of Marxism, Henan Open University, Zhengzhou, Henan, 450003, China

SUMMARY: *Within the framework of the Grand Civic and Political Perspective, this study devises an artificial - intelligence - based project - oriented teaching model for physical education courses in vocational colleges and universities. Moreover, the CIPP model is employed to establish an evaluation system for the project - based teaching of Civic and Physical Education Courses in these institutions. This evaluation system consists of 4 primary - level indicators, 9 secondary - level indicators, and 25 tertiary - level indicators.In conjunction with the Analytic Hierarchy Process (AHP), weights are assigned to each level of indicators in the evaluation system, followed by a quantitative analysis. Subsequently, the fuzzy Topsis evaluation measurement method is utilized to assess the performance of individual indicators. The findings indicate that among the primary - level indicators, background evaluation and process evaluation carry relatively higher weights, while input evaluation and result evaluation have lower weights. Specifically, the weight values are 0.4792, 0.2140, 0.1783, and 0.1285 respectively.From the perspective of the Grand Scholarship, when vocational colleges and universities implement programmed physical education teaching, they should place emphasis on students' learning needs and the school's physical - education - related environmental foundation. This focus is crucial for substantially improving students' learning achievements.The methodology presented in this paper offers a more scientific and detailed comprehensive assessment of the physical education teaching capabilities of vocational colleges and universities.*

KEYWORDS: *AHP-TOPSIS comprehensive evaluation method; big thinking perspective; CIPP model; physical education teaching*

1 Introduction

"Comprehensive Ideological and Political Education" refers to an educational approach where all departments within an institution cooperate to generate a combined effect and jointly advance ideological and political education [1]. Physical education is a required course in vocational colleges and universities, so physical education instructors are also expected to play a crucial and unique role in the framework of "Comprehensive Ideological and Political Education."To begin with, physical education teachers in vocational colleges and universities need to understand the significance of integrating civic and political education into physical education classes. They should carry out moral education during physical education sessions, incorporating elements such as patriotism, ideals and beliefs, as well as the responsibilities and missions of modern college students into daily physical education teaching. This helps students

*zhjz119@163.com
https://doi.org/10.65102/is2026611 Published: 30 April, 2026

develop a proper worldview, outlook on life, and set of values [2, 3]. Secondly, physical education teachers in vocational colleges and universities serve as role - models for students' daily behavior. They are also instrumental in cultivating students' lifelong habits of physical exercise.Finally, physical education teachers in these institutions should integrate ideological education into students' extracurricular sports competitions and after - school physical activities[4]. However, in teaching practice, physical education teachers seem to be only a sports skills transmitter, with little relationship to Civic-Political education, and such an approach ignores the function of establishing morality and shaping people that physical education should also have. Against this backdrop, it holds substantial importance to delve into the optimization route of physical education courses in vocational colleges and universities from the perspective of Grand Civic and Political Education.

Scholars from both domestic and international backgrounds have diverse conceptual interpretations of the project - based teaching approach. Some academics characterize project - based learning as an open - ended learning style, advocating learner-oriented teaching activities, in which the students, through answering open-ended questions, go through the process of discovering knowledge, proposing solutions, collecting and processing information, and making products, which most make the problem solved [5, 6]. Regarding the research on project-based teaching, literature [7] believes that the key to promote the project-based teaching is to clarify the key points of teachers' efficient teaching, for which they have extracted the core guidelines of project-based teaching: Teachers need to strengthen students' subject foundation, create practical learning scenarios, create a classroom atmosphere of “output-feedback-reflection-revision,” and cultivate students' self-directed learning ability in a learning community. Literature [8] suggests that project-based teaching is an important path to achieve interactive learning, and its role in promoting the development of learner competence has been agreed upon, and that the development of project competence in music education students needs to rely on project-based learning as a key educational method in colleges and universities. Through a systematic review, a study [9] has pinpointed the frameworks, models, technologies, and tools that facilitate the efficient execution of project - based learning integrated with computational thinking. It has also examined the existing deficiencies in the implementation process and established a categorization system. Literature [10] suggests that incorporating project-based learning as an integrative teaching strategy into teacher training can effectively increase teachers' self-efficacy in conducting project-based learning courses to meet the curricular requirements for developing students' 21st century skills, and emphasizes that sustained attention to pedagogical methodology, curricular design, and skill acquisition is the key to developing 21st century pedagogical competencies. According to a study [11], project - based learning not only boosts students' academic achievements but also aids in the cultivation of essential soft skills, and that schools need to provide high-quality, adaptable instructional resources developed by experts, complementary professional development support for teachers, and a collaborative culture at the whole-school level to achieve successful implementation of project - based learning.

In the wake of the swift advancement of artificial intelligence, its utilization within the educational domain has grown increasingly prevalent. It has emerged as a crucial catalyst for driving the high - quality evolution of education, giving rise to a novel educational paradigm and form. Consequently, delving into the integration of artificial intelligence into the physical education curriculum of vocational colleges and universities has emerged as a significant approach to spearheading innovation and transformation in physical education [12, 13]. To tackle the issue of inadequate precision in action recognition and body state monitoring in the traditional sports teaching mode, literature [14] proposes an improvement program that integrates artificial intelligence technology, develops a model for recognizing human

movements that relies on long - and short - term memory neural networks, realizes accurate recognition of students' movement state through a three-layer architecture of data acquisition, computation, and visualization, and monitors students' state with the help of an intelligent wearable system and establishes a feedback mechanism for teaching. We also use a smart wearable system to monitor students' status and establish a feedback mechanism for teaching and learning. In addition, literature [15] argues that AI technology can be deeply involved in the strategy development, process tracking and result evaluation of physical education teaching to effectively improve the quality of teaching, however, the application of AI in physical education is still in the preliminary stage, emphasizing that physical education teachers need to master AI-related skills and knowledge to cope with the demand for intelligent teaching. Literature [16] constructed an artificial intelligence model based on multimodal neural networks, This approach depends on a generative pre - trained converter framework to assess students' physical fitness levels and formulate personalized physical education curricula. The findings indicated that artificial intelligence can proficiently achieve precise customization of physical education courses according to students' individual traits and disparities in physical fitness.In reference [17], the suitability of AI technology in school tennis instruction was investigated. An intelligent teaching framework was developed, which included an expert system, an image - capturing system, and an intelligent voice system. Additionally, a CS - FCM framework was designed based on the concept of compressed sensing to learn large - scale fuzzy cognitive maps from time - series data. This effectively addressed the difficulties encountered by the automatic learning method in the AI teaching support system.Reference [18] built a physical education teaching system that integrates the Internet of Things (IoT) and AI. It elaborated on the importance of AI technology in the reform of physical education classroom teaching and put forward a specific teaching application model. Experiments and studies demonstrated that this new model can boost teaching efficiency by approximately 14.7% and significantly enhance the quality of teaching.

From the viewpoint of broad Civic and Political Education, this research paper initially presents the execution approach for an AI - integrated higher vocational physical education initiative. The presentation is carried out across four dimensions: the concept, the mode, the framework, and the structure of the program. Subsequently, the logical structure of the teaching assessment system and model is presented. This system encompasses four primary - level indicators, including an assessment of the context and an evaluation of the resources input, nine second-level indicators, such as willingness to demand and environmental foundation, and 25 third-level indicators, such as students' willingness to accept the course's Civic and political education and schools' willingness to carry out Civic and political courses, is constructed. After that, The Analytic Hierarchy Process (AHP) is employed to allocate weights to the indicators across all levels. Subsequently, the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) evaluation approach is used to ascertain the distance between the indicators and the positive and negative ideal solutions. An optimal solution is then derived to assess the evaluation level. Eventually, an empirical analysis of the physical education teaching effect in each higher vocational school is carried out using the innovation ability evaluation method based on fuzzy AHP - TOPSIS technology. This analysis is conducted after the implementation of project - based teaching in physical education courses from the perspective of the grand ideology and politics.

2 Execution Approaches and Assessment of Physical Education Initiatives in Higher Vocational Institutions and Universities from the Standpoint of Comprehensive Ideology and Politics

2.1 Tactics for the execution of an AI - integrated higher vocational physical education curriculum from the viewpoint of Comprehensive Ideology and Politics

2.1.1 Curriculum philosophy

Project - based instruction commences by taking into account the professional traits of every student. It integrates teaching goals, teaching content, and teaching approaches into a single entity. Subsequently, it enables students to select their preferred sports activities, including basketball, table tennis, track - and - field, taekwondo, yoga, and other such programs.The civic element embedded in physical education classes serves as the essential theoretical basis for the civics aspect of sports courses. Conversely, sports courses act as the vehicle for the civic element. These two aspects mutually promote and complement one another.

2.1.2 Course format

Students select classes independently through the school's teaching system based on their own qualities, interests, and faculty availability.

High-quality online educational resources not only help to maintain students' participation in online classes, but also contribute to boosting students' enthusiasm for engaging in online learning and fostering students' long - term consciousness and routines of physical exercise.

The proficiency of physical education instructors in information technology is a crucial determinant of the quality of online teaching. Physical education teachers ought to proactively engage in information technology training programs. By doing so, they can improve their individual capabilities to handle online teaching assignments. This will enable them to achieve an effective integration of information technology and classroom instruction, thereby facilitating the transformation and reform of teaching approaches.

Educators, who are responsible for disseminating knowledge, play the role of instructors. Meanwhile, learners serve as the primary participants in the learning process. Students engage in at - home exercises with the guidance provided by teachers via online platforms. The teaching ideology of teachers has undergone a transformation, shifting from the conventional educational concept to the online teaching concept. .

With the school, family, teacher factors cooperate with each other, mutual feedback, mutual support, focusing on students as the central element, a scientific and effective online teaching model is established to ultimately foster students' lifelong physical exercise habits. The organic "school - family - teacher" triangular community is presented in Figure 1.

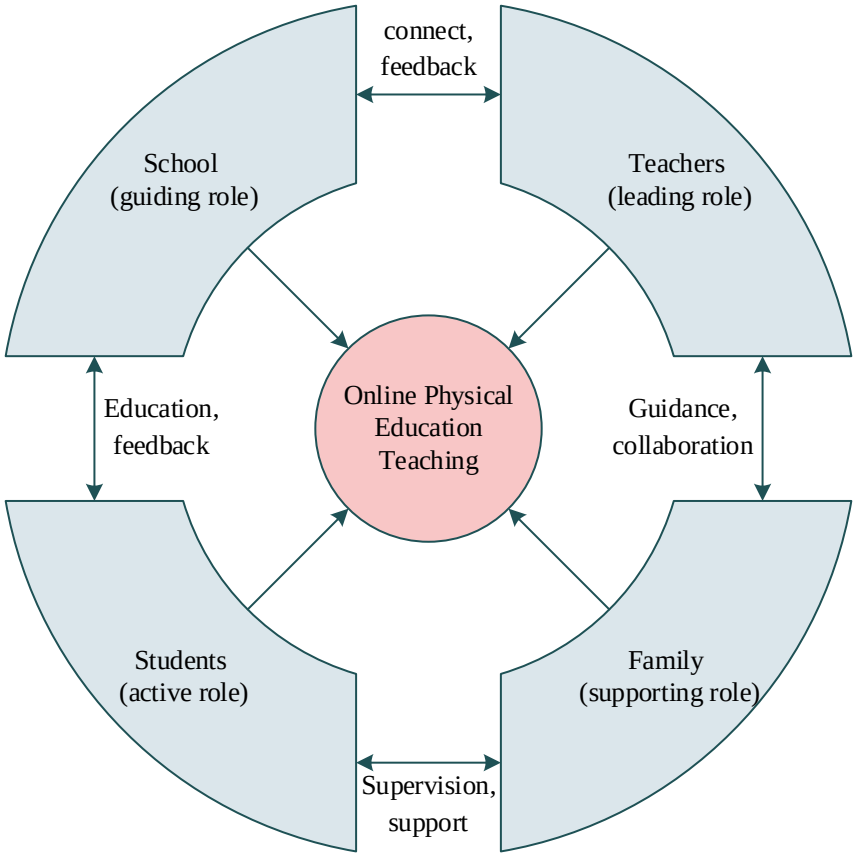

Figure 1: Online Physical Education Teaching Co-cultivation Model

2.1.3 Curriculum

This paper constructs teaching content suitable for higher vocational students according to three major directions: students' future vocational job adaptability, future vocational physical training programs, and lifelong sports skills.

1) “Special + vocational” regular program of physical education courses

The setting mode of “special + vocational” higher vocational physical education option course can complete the transition of higher vocational physical education option,boost students' enthusiasm for learning physical education and enhance their physical well - being.

2) Optimization project of “career + physical fitness” sports courses

The primary objective of vocational college physical education is to enhance students' physical strength and well - being. Physical education teachers carry out positive physical fitness optimization training for students, discover teaching methods suitable for students' growth and development characteristics, and improve their own teaching quality.

3) “Career + Specialty” Lifelong Physical Exercise Programs

During the process of conducting educational instruction, physical education teachers should help students establish the concept of lifelong sports, start from professional characteristics, develop lifelong sports programs for students according to their sports characteristics, develop students' lifelong sports exercise methods, cultivate students' willpower, and form lifelong sports specialty programs.

2.1.4 Course structure

The configuration and framework of physical education courses in higher vocational institutions ought to comprehensively integrate the traits of social needs, professional needs,

student needs and vocational needs to build a curriculum system with strong vocational characteristics.

1) Classification and stratification, teaching students according to their abilities. Focus on the individual, according to the physical quality of higher vocational students, interest in specialties, sports ability, etc. will be divided into a number of teaching classes, targeted teaching.

2) Independent choice, free development. All students break the boundaries of majors and classes, and independently choose their favorite sports programs under the guidance of physical education teachers.

3) Project carrier, task-driven. Teachers use project carrier, task-driven way in each class. Teachers make clear the lecturing objectives, lecturing contents, teaching methods and assessment methods of the option courses, with mutual-help type groups, to form sports skills.

2.2 Assessment Framework for Project - Centered Instruction in Civic and Physical Education Courses at Higher Learning Institutions

2.2.1 Evaluation system construction

Table 1 presents the assessment index framework for the Civic and Political aspects of Physical Education courses in higher education institutions. This assessment framework is primarily segmented into four overarching indicators, nine intermediate - level indicators, and 25 detailed indicators. The four top - tier indicators encompass background assessment, input assessment, process assessment, and outcome assessment. The nine second - tier indicators are: willingness to demand, environmental foundation, curriculum civics teaching resources, teacher team construction, students' learning process, teachers' teaching process, students' achievements and gains, teachers' knowledge structure and teaching effect; students' willingness to accept curriculum civics education, schools' willingness to carry out curriculum civics courses, teachers' willingness to teach civics, and 25 third-level indicators. There are 25 three-level indicators, including students' willingness to receive education on curriculum civics and politics, schools' willingness to carry out curriculum civics and politics courses, and teachers' willingness to teach curriculum civics and politics.

Table 1: Evaluation Index System of Physical Education

Primary indicator	Abb	Secondary indicator	Abb	Tertiary indicator	Abb
Background evaluation	A	Willingness demand	A1	Students' willingness to accept ideological and political education in courses	A11
				Willingness of School to Carry out Ideological and Political Courses	A12
				Teachers' Willingness to Teach Ideological and Political Education in Curriculum	A13
		Environmental base	A2	Curriculum Training Program	A21
				Teaching method	A22
				Students' awareness of ideological and political education in courses	A23
				Teachers' cognitive level of ideological and political education in curriculum	A24
				The school has introduced policies and systems for integrating ideological and political education into curriculum.	A25
				Construction of School Sports Grounds and Equipment	A26
Enter a comment	B	Curriculum Ideological and Political Teaching Resources	B1	Case Library of Ideological and Political Teaching in Physical Education	B11
		Faculty Development	B2	Number of ideological and political education teachers in schools	B21
				Teachers' Ideological and Political Teaching Ability in Professional Courses	B22
				The Training of Ideological and Political Teachers	B23
				Organize professional lectures and exchange meetings on ideological and political education.	B24
Process evaluation	C	Student Learning Process	C1	The Change of Volleyball Technique and Theory	C11
				Whether Students Can Actively Absorb the Content of Ideological and Political Education in the Course	C12
				Can traditional sports spirit be integrated into the learning process under normal circumstances?	C13
		Teacher instructional process	C2	Is the combination of professional knowledge and ideological and political education content	C21
				Be patient in guiding students and lead by example	C22
				Integrate theory with practice and incorporate it into competitions	D23
Results Evaluation	D	Student Performance and Outcomes	D1	Including students' academic performance, outlook on life, and values	D11
				Whether the integration of ideological and political education in courses promotes students' learning of their majors	D12
		Knowledge structure of teachers	D2	Optimize the curriculum ideological and political education system	D21
				Personal Ideological Development	D22
		Teaching efficiency	D3	Improvement of Ideological and Political Education into Teaching System	D31

2.2.2 Logical Framework of the Evaluation Model

Utilizing the fuzzy - Topsis assessment model of the moral education component within sports courses at vocational colleges, the evaluation indexes are firstly assigned by AHP to get the

subjective weights of the indexes. Then, the fuzzy matrix of the indicator data is determined by assigning values to the indicators by using the number of fuzzy intervals in the way of expert scoring. The weights derived from the Analytic Hierarchy Process (AHP) are substituted into the fuzzy matrix to generate the weighted fuzzy matrix. Subsequently, the positive and negative ideal points of the weighted fuzzy matrix are identified. Finally, the Technique for Order of Preference by Similarity to Ideal Solution (Topsis) is employed to measure the positive and negative ideal solutions and the degree of closeness of the civic governance of physical education programs in higher vocational colleges, thereby determining the level of such civic governance. The logical framework of the AHP - Fuzzy - Topsis method is presented in Figure 2.

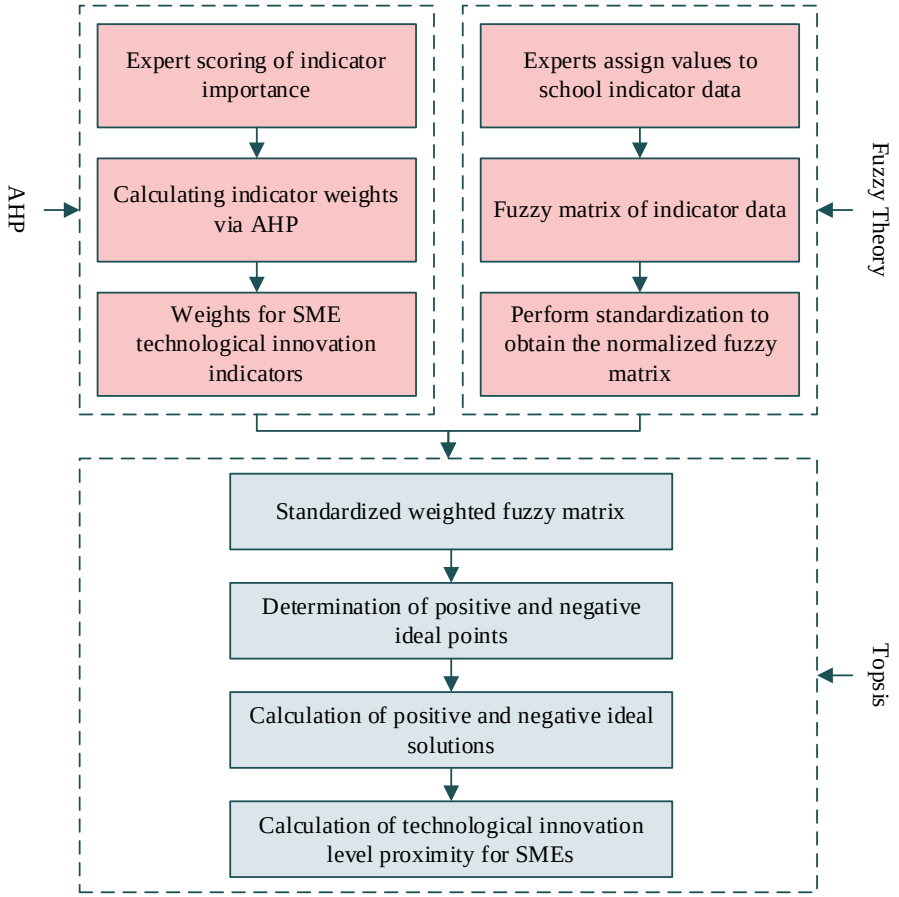

Figure 2: Logical frame of fuzzy-Topsis

2.3 Evaluation Approach for Teaching Quality Relying on Fuzzy Analytic Hierarchy Process - Technique for Order Preference by Similarity to Ideal Solution

2.3.1 Indicator assignment based on the AHP method

When subjectively assessing each indicator, each expert and scholar has different subjective tendencies, so the scoring data of the indicators vary. In order to minimize such differences, This research paper demonstrates the significance of indicators via semantic evaluation, enabling experts to comprehensively convey their intentions for evaluating the value. Let a_{ij} be the importance degree of indicator i relative to indicator j, and n be the number of indicators, and construct the two-by-two judgment matrix A between the factors of each layer

by Delphi method, and satisfy: $a_{ij} > 0$, $a_{ij} = 1/a_{ji}$, $a_{ii} = 1$, as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{21} & \cdots & a_{1n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n1} & \cdots & a_{nn} \end{bmatrix} \tag{1}$$

Through the matrix A in equation (1), The square - root approach is employed to gauge the weights of every indicator:

$$h_i = \sqrt[n]{\prod_{i=1}^{n} a_{ij}} \tag{2}$$

The square - root approach is employed to gauge the weights w_i of every indicator:

$$w_i = \frac{h_i}{\sum_{i=1}^{n} h_i} \tag{3}$$

It should be noted that in the specific calculation process, there are ratios of importance between the guideline tiers, as well as ratios of importance for each indicator under the guideline tier, so the weights are calculated and then converted accordingly to the weights of each indicator in relation to the entire indicator system.

2.3.2 Quantitative analysis based on interval fuzzy numbers

In this paper, the qualitative indicators are judged by semantic values, and the qualitative indicators are quantified by assigning values to the semantic values through interval fuzzy numbers, which solves the problem of poorly quantified qualitative indicators in the evaluation Regarding the capacity for technological innovation.

1) Determine the value of indicators through semantic value judgment

When assessing the quality of physical education course instruction in vocational and regular higher education institutions within the realm of ideological and political perspectives, taking into account the personal privacy of the experts affecting the uncertainty of the data of each indicator, the data score of the indicators is measured through the semantic value judgment. The semantic value discrimination is categorized into five grades: high, high, average, low, and low. At the same time, the interval fuzzy number indicates the scores of these five levels.

2) Standardized processing of indicator values

Simultaneously, to reduce the disparity in the subjective judgment characteristics of experts, it is essential to conduct a consistency test on the judgment matrix A, that is, to calculate the random consistency ratio (CR) of judgment matrix. If $CR < 0.1$, the results of indicator weights calculated by this matrix are more reasonable and acceptable.

Let v_{ik} be the number of interval fuzzy corresponding to the semantic value of the ith indicator of the kth school, $i = 1, 2, \cdots, n$; $k = 1, 2, \cdots, m$; n is the number of indicators, m is the number of schools, then there are:

$$V = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1m} \\ v_{21} & v_{21} & \cdots & v_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ v_{n1} & v_{n1} & \cdots & v_{nm} \end{bmatrix} \tag{4}$$

Let x_{ik} be the standardized data of the i-th indicator for the k-th school. This is the standardized method for the indicator data used in this paper, which is achieved through the standardization method of evaluation indicators:

$$x_{ik} = \frac{v_{ik}}{\max\limits_{1 \le k \le m}(v_{ik})} \tag{5}$$

Let y_{ik} be the k th school weighted value of the i th indicator:

$$y_{ik} = x_{ik} * w_i \tag{6}$$

The interval data assigned to the indicators by the experts are converted into weighted interval fuzzy numbers. This conversion serves as a basis for the subsequent development of an evaluation model for technological innovation capability that is based on the Topsis method.

2.3.3 Topsis-based evaluation measurements

The underlying concept of the TOPSIS assessment approach is to identify the solution that is nearest to the positive ideal solution and, simultaneously, farthest from the negative ideal solution. This identified solution represents the optimal one. Thus, the crux of the matter lies in pinpointing the positive and negative ideal solutions. Since the process of finding the optimal solution is an extremely intricate problem, the concept of relative proximity is introduced for convenience to measure the size of the two distances, which can ultimately determine the level of evaluation.

1) Ascertain the favorable and unfavorable ideal resolutions for the indicators

Let y_{ik} be the k th school weighted value of the i th indicator, obtained by solving equation (6) above. y_i^+ is the positive ideal solution for the i th indicator and y_i^- is the negative ideal solution for the i th indicator, then:

$$y_i^+ = \max_{1 \le k \le m}(y_{ik}) \tag{7}$$

$$y_i^- = \min_{1 \le k \le m}(y_{ik}) \tag{8}$$

2) Determine the separation from each educational institution to the positive and negative ideal positions.

Let d_k^+ be the distance from the k th school to the positive ideal point and d_k^- be the distance from the k th school to the negative ideal point, then:

$$d_k^+ = \sqrt{\sum_{i=1}^{n}\left(y_{ik} - y_i^+\right)^2} \tag{9}$$

$$d_k^- = \sqrt{\sum_{i=1}^{n} \left(y_{ik} - y_i^- \right)^2} \tag{10}$$

The shorter the distance between the k th school and the positive ideal point, the better the k th school's technological innovativeness; the larger the distance between the k th school and the negative ideal point, the better the k th school's technological innovativeness.

3) Measure the closeness of the school

Let c_k be the closeness of the k th school, then:

$$c_k = \frac{d_k^-}{d_k^+ + d_k^-} \tag{11}$$

Schools are ranked according to the size of the k -school proximity c_k . If the k -school proximity c_k is larger, the k -school has a larger distance from the negative ideal point and a smaller distance from the positive ideal point, which means that the k -school exhibits a greater separation from the negative ideal point and a lesser separation from the positive ideal point; Conversely, if the k -school proximity c_k is smaller, the k -school's distance from the negative ideal point is smaller and also the distance from the positive ideal point is larger, indicating that the k -school has a lower level of technological innovation capability.

3 Evaluation of academic quality based on fuzzy AHP-TOPSIS modeling

3.1 Calculation of the weights within the evaluation indicator framework

3.1.1 Calculation of evaluation indicator weights

In this paper, the judgment matrix set and arithmetic average method are uniformly used to calculate the weight situation of a single expert as well as all experts. As the number of design experts and indicators in this paper is large, and the calculation method is the same, therefore, the score of the judgment matrix of a single expert for both the primary and secondary indicators is chosen as an illustration. Table 2 presents the findings of the judgment matrix computation for the primary indicators. Based on these calculation outcomes, the consistency ratio (CR) is less than 0.1. This meets the requirements of the consistency test, which means that the judgment matrix is valid and the calculation results are reasonable.

Table 2: Results of the first order indicator judgment matrix

	A:Background evaluation	B:Enter a comment	C:Process evaluation	D:Results Evaluation
A:Background evaluation	1	1/3	1/5	0.5
B:Enter a comment	3	1	1/2	2
C:Process evaluation	5	2	1	3
D:Results Evaluation	4	1/2	1/3	1

Based on the calculation results, the judgment matrices for the second - level indicators within each first - level indicator hierarchy are presented as follows.

The judgment matrix of the second - level indicator A is presented in Table 3.W_A =(1), λmax=1.0000,CR=0.0000<0.1, which satisfies the consistency and shows the validity of the judgment matrix.

Table 3: The Judgment Matrix of Secondary Index A

	A1	A2
A1	1	1
A2	1	1

The judgment matrix of secondary indicator B is shown in Table 4. According to the calculation results it is concluded that W_B=(1), λmax=1.0000,CR=0.0000<0.1, which satisfies the consistency and shows the validity of the judgment matrix.

Table 4: The Judgment Matrix of Secondary Index B

	B1	B2
B1	1	1
B2	1	1

The judgment matrix of secondary indicator C is shown in Table 5. According to the calculation results, it is concluded that WC = (1), λmax: 1.0000, C_R = 0.000 < 0.1, which is in line with the consistency test, indicating that the judgment matrix is valid and the calculation results are reasonable.

Table 5: The Judgment Matrix of Secondary Index C

	C1	C2
C1	1	1
C2	1	1

The judgment matrix of secondary indicator D is shown in Table 6. According to the calculation results, CR<0.1 can be obtained, which satisfies the consistency and shows the validity of the judgment matrix.

To conclude, the weighting circumstances of the indicators put forward by all the experts are computed. The weight of each indicator is stratified step - by - step, and the total weight at each stratum amounts to 1. Through this process, the weights of the evaluation system for the ideological and political aspects of public sports courses are ultimately determined.

Table 6: The Judgment Matrix of Secondary Index D

	D1	D2	D3
D1	1	1/3	1/4
D2	3	1	2
D3	4	1/2	1

3.1.2 Determination of Indicator Weights and Result Analysis

Table 7 presents the computed outcomes of the weights for the indicators within the evaluation system. Evidently, the evaluation index system for the ideology and politics of public sports courses primarily consists of four first - level indicators. When arranged in descending order of their weights, the first - level indicators are as follows: background evaluation, process

evaluation, input evaluation, and result evaluation. The corresponding weights for these indicators are 0.4792, 0.2140, 0.1783, and 0.1285 respectively.

Based on the distribution of weights, the distinct weight allocation of each level of indicators indicates that experts hold the view that the comprehensive assessment of the profession should center on these indicators. A large majority of experts concur that the evaluation should, first and foremost, guarantee the students' enthusiasm for the physical education program and the school's environmental basis related to physical education instruction. This is primarily reflected in the establishment of the school's physical education facilities and equipment, the school's adoption of the program's ideological system policy, and the students' eagerness to receive the program's ideological education, specifically civic education. Since the students remain the main participants in the curriculum, for the development of the sports curriculum's civic - related aspects, the implementation must target the students. Only in this way can the problem be fundamentally resolved.

Schools need to have a comprehensive understanding of both the students' learning process and the teachers' instructional process. This understanding is crucial for optimizing the development of students' sports skills. Moreover, it is essential to integrate professional knowledge with ideological and political education content. By doing so, students can more effectively and actively absorb the ideological and political teaching knowledge during the course.In addition, the development of the Civic Politics curriculum requires corresponding investment and outcome evaluation. Through teaching evaluation, we can more accurately determine whether the integration of Civic education in the curriculum promotes students' learning of sports - related professional skills and contributes to their healthy development.

Table 7: Calculation results of weight of each index in evaluation system

Primary indicator	Weight	Secondary indicator	Weight	Tertiary indicator	Weight
A	0.4792	A1	0.1488	A11	0.0809
				A12	0.0252
				A13	0.0427
		A2	0.3304	A21	0.0303
				A22	0.0469
				A23	0.0406
				A24	0.0529
				A25	0.0691
				A26	0.0906
B	0.1783	B1	0.0361	B11	0.0361
		B2	0.1422	B21	0.0308
				B22	0.0195
				B23	0.0348
				B24	0.0571
C	0.2140	C1	0.1169	C11	0.0599
				C12	0.035
				C13	0.0220
		C2	0.0971	C21	0.0349
				C22	0.0514
				D23	0.0108
D	0.1285	D1	0.0500	D11	0.0321
				D12	0.0179
		D2	0.0260	D21	0.0103
				D22	0.0157
		D3	0.0525	D31	0.0525

3.2 Results of fuzzy AHP-TOPSIS analysis

In this segment, three higher vocational institutions in region M are employed as case studies to assess the efficacy of project - based instruction within their physical education curricula.

1) Constructing the fuzzy evaluation matrix

Using the calculated fuzzy AHP standard weights, the three schools were then ranked using fuzzy AHP-TOPSIS. In this study, As the primary indicators for assessing the academic quality of physical education in higher vocational institutions, "A background assessment, B input assessment, C process assessment, and D outcome assessment" were chosen. Nine secondary indicators were selected, including “willingness to demand, environmental foundation, curriculum and teaching resources, teacher training, students' learning process, teachers' teaching process, students' achievements and gains, teachers' knowledge structure and teaching effect”. Calculating the arithmetic mean of the evaluation matrices of all the expert groups, we found that the calculation results satisfied the consistency, which indicated that the judgment matrix was valid.

2) Calculating fuzzy evaluation matrix standardization and weighting

Once the fuzzy decision matrix for expert evaluation has been computed, the fuzzy decision matrix is standardized, and the weighted standardized matrix for the three expert groups is determined. Tables 8 to 11 present the outcomes of the calculations for the weighted standardized fuzzy decision matrix regarding the evaluation of physical education teaching in three higher vocational colleges and universities. These evaluations are classified into four aspects: A - background assessment, B - input assessment, C - process assessment, and D - result assessment. The results show that:

(1) According to the expert ranking analysis of the three schools based on the background evaluation (A), for the three schools, in terms of students' willingness to demand, school 1 > school 3 > school 2; Regarding the foundation of the college's teaching environment, school 3 > school 2 > school 1.

(2) The results of the evaluation study of the input evaluation (B) are that the ranking results of the input evaluation (B) dimension criteria can be derived from the calculations as Curriculum Civics Teaching Resources > Faculty Development. On B1, school 1 > school 2 > school 3, and on B2, school 1 > school 3 > school 2.

(3) The results of the evaluation study of process evaluation (C) were: on C1 and C2, the ranking of all three schools showed that school 3 > school 2 > school 1.

(4) The outcome evaluation (D) showed that on this dimension, the three schools ranked on the three indicators as: school 3 > school 1 > school 2.

Table 8: Background Evaluation of the Calculation Results of Fuzzy Decision Matrix

	A1				A2			
School 1	0.8973	0.1569	0.4896	0.2725	0.0415	0.1153	0.5102	0.3583
School 2	0.8807	0.1409	0.4718	0.2283	0.0420	0.1173	0.5227	0.3494
School 3	0.8873	0.1551	0.4823	0.2418	0.0422	0.1187	0.5319	0.3501

Table 9: Input evaluation on the calculation result of fuzzy decision matrix

	B1				B2			
School 1	0.0306	0.1562	0.5646	0.2453	0.0216	0.1411	0.4296	0.2407
School 2	0.0287	0.1499	0.5752	0.2433	0.0137	0.1373	0.4066	0.2559
School 3	0.0245	0.1476	0.5398	0.2187	0.0183	0.1392	0.4258	0.2457

Table 10: Process Evaluation of the Calculation Result of Fuzzy Decision Matrix

	C1				C2			
School 1	0.1497	0.4053	0.1927	0.5234	0.0380	0.1481	0.4773	0.2481
School 2	0.1503	0.4112	0.2032	0.5345	0.0407	0.1516	0.4886	0.2485
School 3	0.1519	0.4169	0.2575	0.5582	0.0427	0.1439	0.5087	0.2517

Table 11: Outcomes of the assessment of the computed results of the fuzzy decision - making matrix

	School 1	School 2	School 3
D1	0.0309	0.0264	0.0332
	0.1423	0.1517	0.1514
	0.5047	0.0476	0.4916
	0.2451	0.2439	0.0245
D2	0.0268	0.0238	0.0259
	0.1085	0.1023	0.1488
	0.4887	0.4045	0.4889
	0.2404	0.2414	0.0221
D3	0.0343	0.0345	0.0352
	0.1511	0.1544	0.1659
	0.0526	0.0688	0.5059
	0.0265	0.2653	0.0265

3) Identification of positive ideal solutions and negative ideal solutions

Based on the exploration phase of the expert panel assessment, this research identifies the fuzzy positive ideal solution (FPIS, $A*$) and the fuzzy negative ideal solution (FNIS, A -). Tables 12 through 15 present the positive and negative ideal solutions for background assessment, input assessment, process assessment, and outcome assessment, respectively. The findings reveal that the corresponding fuzzy negative ideal solutions for the four primary - level indicators are all zero, while the fuzzy positive ideal solutions are all greater than 0.0000. This indicates that the evaluation indices selected in this study have a positive influence on the physical education courses in vocational and higher education institutions that integrate Civic and Political Education.

Table 12: Optimal and Suboptimal Outcomes in Background Assessment

	A1				A2			
FPIS,A∗	0.1412	0.292	0.9254	0.5155	0.0724	0.1885	0.5068	0.1502
FNIS,A−	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 13: Positive and Negative Ideal Solutions of Input Evaluation

	B1				B2			
FPIS,A∗	0.0506	0.1725	0.5703	0.2638	0.0526	0.1706	0.5359	0.2562
FNIS,A−	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 14: Positive and Negative Ideal Solutions of Process Evaluation

	C1				C2			
FPIS,A∗	0.2617	0.5304	1.2008	0.2747	0.1005	0.1944	0.5199	0.6137
FNIS,A−	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 15: Positive and Negative Ideal Solutions of the Evaluation Results

	FPIS,A∗	FNIS,A−
D1	0.5194	0.0000
	0.3022	0.0000
	0.1366	0.0000
	0.0956	0.0000
D2	0.5222	0.0000
	0.2972	0.0000
	0.1629	0.0000
	0.107	0.0000
D3	0.5227	0.0000
	0.3019	0.0000
	0.1951	0.0000
	0.0991	0.0000

4) Determine the distance and closeness of the assessed object to the positive and negative ideal solutions

The distance of the evaluated object to the positive ideal solution is s_i^+, the distance to the negative ideal solution is s_i^-, and the proximity of the evaluated object is CC_i, so the best choice is in the vicinity of $FPIS$, A^*, and the farthest from $FNIS$, A^-.

Table 16 presents the distances and rankings relative to the positive and negative ideal solutions. Based on the outcomes of the background assessment, it is evident that in the improvement of the input evaluation dimension, the students' demand willingness holds the utmost significance, followed by the physical education environmental foundation. The findings of the input evaluation revealed that after assessing the academic quality of the three schools, School 1 was deemed the top - performing institution, while School 3 was regarded as the least satisfactory. The results of the process evaluation demonstrated that after evaluating the academic quality of the three schools using the FAHP - TOPSIS model, School 3 was rated as the best and School 1 was rated as the worst. The outcome evaluation dimension showed that School 3 was rated the best in the outcome evaluation dimension in terms of instructional effectiveness, School 2 was the next best, and School 1 was the worst. In summary, there are large differences in the learning outcomes of the three schools under different evaluation indicators, indicating that there are differences in the focus of different schools on physical education teaching with Civics content. Therefore, This research paper posits that the three educational institutions can establish the emphasis of instruction based on the relevant weights during the teaching procedure.

Table 16: Distance to the Positive Ideal Solution and the Negative Ideal Solution

Primary indicator	School	s_i^+	s_i^-	$CC_i = \frac{s_i^-}{s_i^+ + s_i^-}$	Ranking
A Background Evaluation	School 1	1.4535	0.2198	0.1314	2
	School 2	1.4494	0.2357	0.1399	1
	School 3	1.5015	0.1921	0.1134	3
B Input evaluation	School 1	1.5887	0.3209	0.1680	2
	School 2	1.4068	0.5078	0.2652	1
	School 3	1.6804	0.3476	0.1714	3
C Process evaluation	School 1	1.2885	0.2364	0.1550	3
	School 2	1.1789	0.2897	0.1973	2
	School 3	1.1279	0.3395	0.2314	1
D Result Evaluation	School 1	1.2904	0.1574	0.1087	3
	School 2	1.1869	0.2998	0.2017	2
	School 3	1.1299	0.3329	0.2276	1

3.3 Empirical Analysis of Academic Evaluation Models in Higher Education Institutions

3.3.1 General characterization

This research relied on simulation experiments and questionnaire gathering to assess ten colleges and universities. After these ten institutions were instructed using the novel teaching approach put forward in this article, the weights of their teaching efficacy were computed based on four indicators, and finally the differences in the results between the two methods were evaluated after the school's results were calculated and re-ranked according to the weights.

The statistical results of school ranking changes are shown in Figure 3. In the figure, the original schools 4, 5, 6 and 7 are all in a tie and ranked 5th; however, after the organic community teaching model of “school, family and teacher” proposed in this paper, the new rankings of the original rankings of 50% of the schools remain unchanged, 30% of the schools decline in rankings, and the rankings of 20% of the schools are improved. The ranking of 20% of the schools improved. This is related to the fact that the new model differentiates between schools that are tied on the basis of school weighting. The biggest mover was school #2, which moved up two spots.

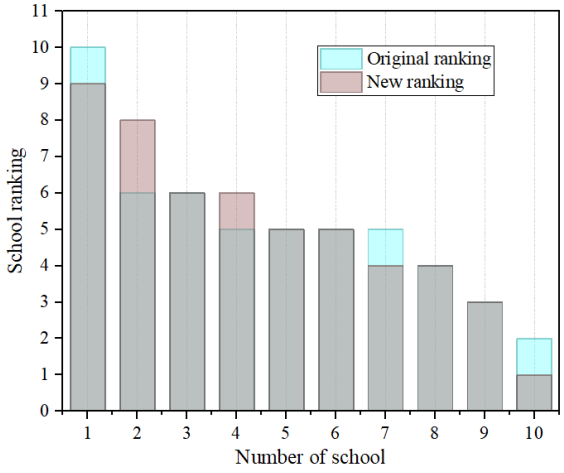

Figure 3: School Ranking Change Statistics

3.3.2 Comparative analysis of cases

To comparatively assess the merits and demerits of the teaching approaches employed in the physical education curricula of various schools in a more straightforward manner, this research selected three educational institutions. Subsequently, it evaluated the efficacy of physical education instruction under the framework of Great Civic Education in each of these higher - learning establishments, taking into account different levels as defined by multiple indicators.

1) Comparison of Schools with the Same Achievement

The study first selects three schools with the same initial ranking for comparison, choosing School 4, School 5 & School 6 as an example, they all scored 15 points in their initial scores, using the new model to score them, the core literacy scores of the three schools are shown in Table 17, such as School 4's background evaluation score of 3.8872, input evaluation score of 3.6859 and so on. Although the total scores of the three schools were the same, all three schools were above average in process evaluation skills. In terms of outcome evaluation, School 3 is slightly better than School 6 and School 5. The comparison between schools reveals that each school will have its own strengths and weaknesses. In the same higher education institution, even if the same number of questions are answered correctly and the same total score is obtained, there is actually a difference in the ability of the school presented behind. The model can be used to explore the core competence of a school through the deep analysis of test questions, and diagnose the school's competence in front-line teaching while assisting teachers to carry out targeted education.

Table 17: Core competency scores for three schools

School	A Background Evaluation	B Input evaluation	C Process evaluation	D Result Evaluation
School 4	3.8872	3.6859	3.3131	3.2111
School 5	3.7799	3.7468	3.3811	3.4542
School 6	3.7894	3.7297	3.3658	3.2268

2) Comparison of core literacy among students with different scores

After profiling the three schools under the same achievement, and then extracting the schools under different total scores, for example, School 1, School 3 & School 8 scored 23, 18 and 13 points in the initial scores, corresponding to the rankings of No. 1, No. 3 and No. 8, respectively, and the computation of each indicator yielded the core literacy scores of the three schools as shown in Table 18. It can be seen that students numbered 1 and 3 are above average in all four evaluation indicators. On all four indicators, School 1 reflected a high level of physical education course taking. Reacting sequentially to the physical education curriculum learning ability of School 3 and School 8, Through comparison, it becomes apparent that the outcome evaluation scores can approximately reflect the physical education curriculum learning capabilities across different schools. In summary, the differentiation of the results after scoring increases substantially, and the physical education course learning ability of the school is further highlighted. Although one assessment result cannot fully reflect the physical education course learning ability of a higher education institution, the application of the model can basically reflect the differences in the physical education course learning ability between schools in the same result. Comprehensive feedback derived from the evaluation outcomes can offer a more distinct comprehension of the school's advantages and drawbacks, and it can also serve as a guide for the teaching practices of front - line educators.

Table 18: Core competency scores for three schools

School	A Background Evaluation	B Input evaluation	C Process evaluation	D Result Evaluation
School 4	5.5112	5.1134	4.5656	4.6131
School 5	4.1147	4.1376	3.8325	3.6833
School 6	2.7809	2.7916	2.2497	2.3616

4 Conclusion

This paper initially presents the implementation approach for AI - integrated higher vocational physical education courses from the perspective of Grand Civic and Political Education. Subsequently, it establishes an evaluation system for project - based teaching of Civic - Physical Education courses in higher vocational institutions. Finally, it analyzes the teaching quality of AI - integrated higher vocational physical education courses across different higher vocational colleges using the evaluation method of fuzzy AHP - TOPSIS technological innovation capacity. The findings are as follows:

1) In the Civic - Physical Education Course Project - based Teaching Evaluation System for Higher Vocational Institutions developed in this paper, the significance of the first - level indicators is ranked from highest to lowest as follows: background assessment > process assessment > input assessment > result assessment. The percentage shares of their weights are 47.92%, 21.40%, 17.83%, and 12.85% respectively.

2) From the perspective of Grand Ideological and Political Education, different higher vocational colleges place different degrees of emphasis on the four evaluation indicators of “Background Assessment, Input Assessment, Process Assessment, and Result Assessment”. For instance, in the process assessment, the ranking of the three schools is School 3 > School 2 > School 1. However, in the result assessment, the ranking changes to School 3 > School 1 > School 2. Thus, in the project - based teaching of Civic - concerned and physical education courses, we can determine the key indicators that higher vocational colleges focus on according to the weights of each - level indicators. Then, we can identify the reasons for the variations in their physical education teaching quality.

3) By using the fuzzy AHP - TOPSIS comprehensive evaluation method, a more scientific and detailed comprehensive assessment of the level of school sports programmed teaching can be achieved. The results are largely consistent with the actual situation and hold certain value.

Funding

This work was supported by the Humanities and Social Sciences Research Project of Henan Province Universities [Grant Number 2024-ZZJH-224, Project: "Research on the Inheritance and Innovative Development of Central Plains Traditional Chinese Medicine Culture from the Perspective of Regional History"] and the Doctoral Research Startup Foundation of Henan Open University.

References

[1] Hu, M., & Wang, Z. (2023). The ideological and political teaching of school physical education courses under the background of big ideological and political. International Journal of Educational Curriculum Management and Research.

[2] Qiu, L., & Ren, G. (2020, July). Research on the Methods of Integration Ideological and Political Education Into Physical Education Curriculum in Higher Vocational Colleges. In 2020 International Conference on Advanced Education, Management and Social Science (AEMSS2020) (pp. 4-7). Atlantis Press.

[3] Qu, X., & Bo, X. (2023). To Assess the Methods of Integrating Ideological Education into The Second Classroom for Physical Education of Higher Vocational Colleges. Eurasian Journal of Educational Research (EJER), (107).

[4] Song, Y. (2023). Research On Ideological and Political Implementation Path of Higher Vocational Physical Education Curriculum. International Journal of Vocational and Technical Education, 3(1), 59.

[5] Jalinus, N., Nabawi, R. A., & Mardin, A. (2017, September). The seven steps of project based learning model to enhance productive competences of vocational students. In International Conference on Technology and Vocational Teachers (ICTVT 2017) (pp. 251-256). Atlantis Press.

[6] Zhang, L., & Ma, Y. (2023). A study of the impact of project-based learning on student learning effects: A meta-analysis study. Frontiers in psychology, 14, 1202728.

[7] Grossman, P., Dean, C. G. P., Kavanagh, S. S., & Herrmann, Z. (2019). Preparing teachers for project-based teaching. Phi Delta Kappan, 100(7), 43-48.

[8] Lasauskiene, J., & Rauduvaite, A. (2015). Project-based learning at university: Teaching experiences of lecturers. Procedia-Social and Behavioral Sciences, 197, 788-792.

[9] Saad, A., & Zainudin, S. (2022). A review of Project-Based Learning (PBL) and Computational Thinking (CT) in teaching and learning. Learning and Motivation, 78, 101802.

[10] Martinez, C. (2022). Developing 21st century teaching skills: A case study of teaching and learning through project-based curriculum. Cogent Education, 9(1), 2024936.

[11] Saavedra, A. R., & Rapaport, A. (2024). Key lessons from research about project-based teaching and learning. Phi Delta Kappan, 105(5), 19-25.

[12] Cao, F., Lei, M., Lin, S., & Xiang, M. (2022). Application of Artificial Intelligence‐Based Big Data AI Technology in Physical Education Reform. Mobile Information Systems, 2022(1), 4017151.

[13] Lee, H. S., & Lee, J. (2021). Applying artificial intelligence in physical education and future perspectives. Sustainability, 13(1), 351.

[14] Liu, T., Wilczyńska, D., Lipowski, M., & Zhao, Z. (2021). Optimization of a sports activity development model using artificial intelligence under new curriculum reform. International Journal of Environmental Research and Public Health, 18(17), 9049.

[15] Wang, Y., & Wang, X. (2024). Artificial intelligence in physical education: comprehensive review and future teacher training strategies. Frontiers in public health, 12, 1484848.

[16] Karvunis, Y. A., Kalinnikova, Y. G., Karvunis, N. A., & Kapilevich, L. V. (2024). Optimization of physical education classes using artificial intelligence for students of SMG. Theory and Practice of Physical Culture, (10), 40-42.

[17] Song, X. (2024). Physical education teaching mode assisted by artificial intelligence assistant under the guidance of high-order complex network. Scientific reports, 14(1), 4104.

[18] Yu, H., & Mi, Y. (2023). Application model for innovative sports practice teaching in colleges using internet of things and artificial intelligence. Electronics, 12(4), 874.