



Investigated and Studied the Core Literacy of Physical Education Students in Higher Vocational Colleges in Fujian Province

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Abstract

Background and Aim: In recent years, core literacy has become an important concept in the reform of teacher education in China. However, the structure and characteristics of core literacy among physical education (PE) students in higher vocational colleges remain insufficiently defined. This study aims to examine the current status, structural dimensions, and development strategies of core literacy among PE students in Fujian Province, thereby supporting competency-based reform in vocational PE teacher training.

Materials and Methods: This study employed a mixed-methods research design involving literature review, expert interviews, questionnaire surveys, and statistical analysis. The target population consisted of 950 junior PE students from five higher vocational colleges in Fujian Province, including both public and private institutions. Qualitative data from expert interviews were coded using NVivo 12, while quantitative data from structured questionnaires were analyzed using AMOS. The Analytic Hierarchy Process (AHP) and Confirmatory Factor Analysis (CFA) were applied to construct and validate the core literacy model.

Results: The findings indicate that the core literacy of PE students consists of four major dimensions: sportsmanship, sports practice, health promotion, and teaching practice. A total of 21 key indicators were identified and validated under these dimensions. Path coefficient analysis showed that sportsmanship had the highest weight (0.4049), followed by health promotion (0.2225), teaching practice (0.1902), and sports practice (0.1824). These results confirm the multidimensional nature of PE students' core literacy and provide empirical support for a competency-based training model in higher vocational PE education.

Conclusion: The study concludes that PE students demonstrate relatively strong performance in sportsmanship and health promotion but show weaker competence in teaching practice. Therefore, vocational colleges should strengthen practical teaching opportunities, internships, reflective learning, and pedagogical training to enhance students' professional teaching competence. The validated core literacy model offers a useful reference for curriculum reform, student evaluation, and teacher training development in higher vocational PE programs.

Keywords: Core Literacy; Physical Education; Vocational Colleges; Teacher Education; Fujian Province

Introduction

The quality of a nation's education system serves as a critical foundation for its social and economic development, and at the heart of that system are well-trained, competent teachers. Recognizing this, the Central Committee of the Communist Party of China has highlighted the importance of strengthening teacher education—particularly in physical education (PE), where teachers are expected to play a pivotal role in promoting national health and lifelong fitness. In recent years, General Secretary Xi Jinping has emphasized the development of a strong PE workforce, aligning with global calls—such as those by UNESCO (2006)—for improving the quality and accessibility of physical education in schools.

In January 2025, the Ministry of Education of China released the “Notice on Several Measures for Strengthening the Construction of Primary and Secondary School PE Teachers in the New Era,” which outlines a strategic framework for enhancing the professional quality and training systems of PE teachers. One key directive focuses on nurturing “Mr. Da”-type educators—professionals who integrate moral integrity, pedagogical excellence, and leadership capabilities (Li & Lv, 2017). These expectations reflect China's broader ambition to build itself into both an educational and sports powerhouse (Wang et al., 2019).

Traditionally, the physical education major in higher education has emphasized technical and instructional skill development. However, the post-pandemic context has accelerated a shift in educational



paradigms, requiring PE professionals not only to teach but also to promote health, lead physical literacy initiatives, and contribute to students' lifelong wellness (Gu, 2021; Jiang, Ma, & Zhao, 2019). In this context, the notion of “core literacy” in PE has gained increasing attention. This concept refers to the essential competencies, values, and behaviors that PE students must acquire to meet modern educational demands.

Despite its growing significance, the structure and practical application of core literacy in the context of PE education—especially in higher vocational colleges—remain underexplored. Most existing research focuses on general teacher education or elite sports training, leaving a critical gap in the literature concerning how vocational PE students develop competencies that align with evolving curricular standards and health priorities (Cao, 2021; Lipei et al., 2018). Furthermore, there is limited empirical evidence guiding the design of curricula and teaching strategies tailored to the unique needs of vocational institutions. To address this gap, this study investigates the core literacy of students majoring in physical education at higher vocational colleges in Fujian Province. Specifically, it aims to: (1) define the conceptual and structural dimensions of core literacy in this context, (2) assess the current state of core literacy among PE students, and (3) propose targeted strategies to improve these competencies in alignment with national policy directions and modern educational theory. The findings are intended to inform curriculum reform, enhance teacher training practices, and support the holistic development of PE professionals in China's vocational education system (Campbell et al., 2003; Jackson & Bazeley, 2019; Yu et al., 2024).

Objectives

1. To explore the meaning and components of Core Literacy among physical education students in higher vocational colleges in Fujian Province.
2. To investigate and analyze the level of Core Literacy among physical education students in higher vocational colleges in Fujian Province.
3. To develop an evaluation index model for assessing Core Literacy among physical education students in higher vocational colleges.

Literature review

1. Conceptualizing Core Literacy in Physical Education

Core literacy is broadly defined as a holistic integration of knowledge, skills, attitudes, and values necessary for individuals to participate effectively in society and engage in lifelong learning (UNESCO, 2006). In the context of physical education (PE), this concept extends beyond physical capability to encompass teaching competencies, personal integrity, and health awareness. Jiang, Ma, and Zhao (2019) emphasized that core literacy in PE must align with both educational values and professional teaching standards, particularly as the role of PE educators evolves in response to national health priorities.

2. Dimensions and Frameworks of Core Literacy for PE Students

Scholars have attempted to operationalize core literacy in PE by proposing various structural models. Lipei et al. (2018) introduced a four-dimensional framework consisting of sportsmanship, sports practice, health promotion, and teaching practice, each representing a facet of a PE student's personal development and professional competence. Cao (2021) further argued that true core literacy should emphasize not only physical proficiency but also moral development, instructional effectiveness, and the ability to integrate health education into practice. However, existing frameworks often lack empirical validation within the context of China's vocational education system, particularly in provinces like Fujian.

3. Core Literacy in Curriculum Reform and Pedagogical Innovation

With the implementation of China's new curriculum standards in 2022, integrating core literacy into teaching and learning has become a national priority. Li and Lv (2017) proposed an analytical framework for aligning curriculum objectives with vocational competency development, suggesting that teacher education programs must reorient their learning outcomes to include broader competencies beyond content

knowledge. This aligns with international shifts toward outcome-based education, where core literacy serves as a benchmark for curriculum quality and relevance.

4. Influences of Learning Environment and Practical Experience

The development of core literacy is not limited to formal curriculum; it is also shaped by students' experiential learning and institutional environments. Gu (2021) found that participation in structured physical activities and exposure to supportive learning environments significantly enhance motivation, self-regulation, and physical competence among PE students. Similarly, Campbell et al. (2003) stressed the role of mentorship and institutional support in cultivating the broader competencies associated with teaching and leadership in physical education.

5. Assessment Methodologies and Empirical Models of Core Literacy

Measuring core literacy poses several methodological challenges due to its multi-dimensional and abstract nature. Jackson and Bazeley (2019) advocated for mixed-methods research combining qualitative insight with robust quantitative tools. Yu et al. (2024) applied Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) to test theoretical models and assess the interrelationships among literacy components. Yet, few studies have applied such models specifically to vocational college PE students in China, highlighting the need for localized, empirically grounded evaluation tools.

6. Research Gap

Despite growing scholarly interest, there remains a lack of validated, context-specific models that define and assess core literacy among PE students in China's vocational education sector. Most current frameworks are either conceptual or based on general teacher training models, without sufficient adaptation to the realities of vocational institutions. This study seeks to address this gap by constructing and validating an evaluation model tailored to PE students in higher vocational colleges in Fujian Province.

Conceptual Framework

This study proposes a conceptual framework that explores how various educational inputs influence the development of core literacy among physical education (PE) students in higher vocational colleges. The framework is grounded in the theory of outcome-based education and draws upon relevant elements from pedagogical content knowledge (PCK) and the social-ecological model.

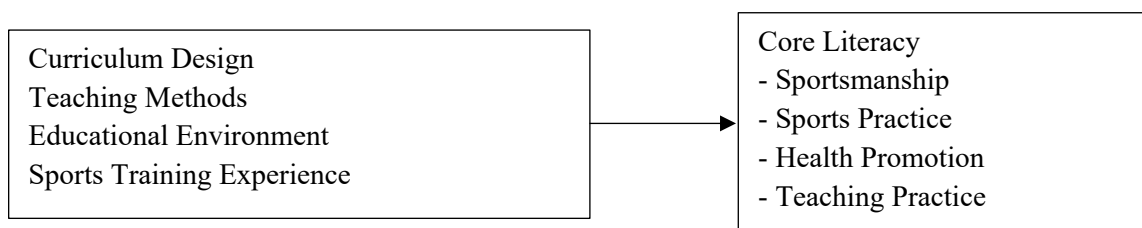


Figure 1 Conceptual Framework

Specifically, four independent variables are proposed as key influencing factors:

1. Curriculum Design – the extent to which the academic curriculum aligns with core literacy goals and integrates interdisciplinary content;
2. Teaching Methods – including learner-centered, experiential, and reflective teaching strategies that enhance students' understanding and engagement;
3. Educational Environment – institutional support, peer collaboration, availability of facilities, and overall campus culture;
4. Sports Training Experience – students' participation in practical training, internships, competitions, and extracurricular physical activity.

These independent variables are hypothesized to affect the development of Core Literacy, conceptualized as a multidimensional construct comprising four dependent variables:

- Sportsmanship – ethical behavior, cooperation, resilience, and respect for rules and opponents;

- Sports Practice – physical and technical skill performance, application of motor learning principles;
- Health Promotion – awareness and advocacy for personal and public health, fitness, and wellness;
- Teaching Practice – pedagogical planning, instructional delivery, classroom management, and reflective teaching.

This framework assumes that improvements in the quality and coherence of educational inputs will positively impact each dimension of core literacy. The model guides the development of the questionnaire and the subsequent Confirmatory Factor Analysis (CFA), ensuring that the assessment reflects both theoretical and practical foundations.

Methodology

This study employed a mixed-methods design, integrating both qualitative and quantitative approaches to develop and validate a Core Literacy Evaluation Model for physical education (PE) students in higher vocational colleges. The research process was divided into three phases: conceptual exploration, indicator development, and empirical validation.

Population and sample

- Population: Physical education students enrolled in higher vocational colleges in Fujian Province.
- Sample: A total of 878 students were selected through purposive sampling from five vocational institutions representing both public and private colleges.
- Expert Group: A panel of 15 experts in physical education, teacher training, and educational assessment participated in the Delphi Method and in-depth interviews.

Research instruments

1. Expert Interview Guide: Designed to collect qualitative data regarding the definitions, dimensions, and indicators of core literacy.

2. Questionnaire Development: Developed based on literature review, expert input, and preliminary qualitative findings.

- The Delphi Method was applied in two rounds to refine and validate core literacy indicators.

- The Analytic Hierarchy Process (AHP) was used to assign relative weights to each indicator based on expert scoring.

3. Model Validation Tools:

- AMOS Software was used to perform Confirmatory Factor Analysis (CFA) for validating the structural model of core literacy.

Data Collection Procedures

The research was implemented in three phases:

1. Phase 1: Literature Review and Theoretical Foundation

- Analyzed global and domestic literature on core literacy and PE education.
- Identified theoretical constructs relevant to vocational training contexts.

2. Phase 2: Qualitative Data Collection

- Conducted in-depth interviews with 15 experts.
- Thematic analysis was used to extract key indicators, which informed questionnaire design.

3. Phase 3: Quantitative Data Collection and Model Testing

- Conducted two rounds of Delphi surveys to refine indicators.
- Applied AHP to determine indicator weights.
- Administered the finalized questionnaire to 878 PE students across five institutions.
- Collected demographic and background data for subgroup analysis.

Data Analysis

1. Qualitative Analysis: Content Analysis using NVivo 12 software to identify core themes from interview data.

2. Quantitative Analysis:

- Descriptive Statistics: Mean, standard deviation to describe central tendencies.

- Inferential Statistics: Independent t-tests and ANOVA to compare groups.
- Factor Analysis:
 - CFA (Confirmatory Factor Analysis) to examine model fit and construct validity.
 - Structural Equation Modeling (SEM) using AMOS to assess relationships between dimensions.
- Model Fit Indicators include:
 - Chi-square (χ^2)
 - Comparative Fit Index (CFI)
 - Root Mean Square Error of Approximation (RMSEA)

Model Validation and Interpretation

The validation process was based on accepted statistical thresholds for model fit. Key findings were interpreted to inform strategies for curriculum improvement, teacher training, and competency-based assessment in vocational PE programs.

Research Ethics

- Informed consent was obtained from all participants.
- Participant confidentiality and data anonymity were strictly maintained.
- The research process adhered to institutional ethical guidelines and emphasized transparency and objectivity in data interpretation and reporting.

Results

To establish a clear modeling framework, this study adopted a standardized variable coding method, using the first two characters of each variable name as the basic identifier, and constructing a systematic coding system by adding sequential numbers. This coding method ensures the accuracy of data mapping while laying a standardized foundation for subsequent model analysis. The variables involved in the study and their corresponding item codes are as follows Table 1.

Table 1 Scales used in this study

Variable name	number	Questioning of the subject matter
Sportsmanship	SS1	I follow major sporting events (such as the Olympics, NBA, World Cup, etc.) and often discuss them with others.
	SS2	I would like to help others improve their sports level.
	SS3	I can take the initiative to participate in physical exercise and enjoy the process of exercise.
	SS4	I can develop self-discipline in physical exercise.
	SS5	I respect the decisions of referees in sports competitions.
Sports practice	SP1	I actively participate in extracurricular sports activities (gym, running, swimming, etc.).
	SP2	I have participated in sports competitions organized at the school level and above.
	SP3	I will take the initiative to improve my sports skills through self-media and other means.
	SP4	I can assess myself in sports activities and adjust my training strategy according to feedback.
	SP5	I am proficient in two or more sports skills (ball, martial arts, physical fitness, etc.).
	SP6	I can write sports lesson plans (training plans) skillfully.



Variable name	number	Questioning of the subject matter
Health promotion	SP7	I have worked as a judge in small sports events for classes, schools, and communities.
	SP8	There are emergencies during the game. I can properly coordinate the relationship between all parties.
	SP9	I exercise more than three times a week.
	HP1	I can adjust the way and intensity of my exercise according to different seasons and environments.
	HP2	I plan my diet according to my physical condition and physical ability.
	HP3	I can control my exercise load in sports and avoid overtraining.
	HP4	I can use scientific recovery methods according to the degree of fatigue after exercise.
	HP5	I don't wash my mouth with cold water immediately after exercise.
	HP6	I have a healthy lifestyle (do not smoke, do not drink excessively, do not stay up late, etc., any of which is not considered to be lacking).
	HP7	I can handle common sports injuries (scratches, joint sprains, muscle strains, etc.).
Teaching practice	TP1	I can explain the technical movements with concise language and standard action demonstration, so that students can understand and master the technical movements.
	TP2	I can effectively stimulate students' interest in learning and enthusiasm for class participation.
	TP3	I can plan the use of equipment reasonably.
	TP4	I can accurately issue passwords and organize formations (such as division, combination, snake march, diagonal march, etc.).
	TP5	I can deal with emergencies in physical education calmly.
	TP6	I can design personalized teaching programs according to students' age, physical fitness, and interests.

First, describe the statistics for the sample's basic information. This study adopted a concentrated fieldwork approach for data collection, with the survey period running from September 2024 to December 2024. We contacted the heads of physical education departments at five vocational colleges in Fujian Province (School A, School B, School C, School D, and School E). After obtaining permission for the survey, we distributed paper questionnaires to the students. The data recovery status from the five schools is shown in the table below.

Table 2 Statistics of questionnaire recovery in each university

school name	Questionnaire distribution (no)	Recycling of questionnaires (no)	Number of valid questionnaires (no)	Effective recovery rate (%)
A check	50	48	44	88
B check	370	365	349	94.32
C check	100	98	94	94
D check	95	92	88	92.63



school name	Questionnaire distribution (no)	Recycling of questionnaires (no)	Number of valid questionnaires (no)	Effective recovery rate (%)
E check	335	335	303	90.45
amount to	950	938	878	93.6

Note: Effective recovery rate = effective questionnaire number / distributed questionnaire number × 100%

The collected questionnaire data underwent rigorous screening, with exclusion criteria including: questionnaires answered in less than 100 seconds, questionnaires with the same option selected for 10 consecutive questions or more, and questionnaires where key information (such as gender and age) was filled out improperly. After data cleaning, a total of 878 valid questionnaires were obtained, with an effective response rate of 93.60%. The basic information of all valid respondents is shown in Table 3.

Table 3 Basic information on valid samples

Statistical items	Option	Frequency	Percentage
sex	man	720	82.005%
	woman	158	17.995%
age	Under 18	0	0.000%
	18-19 years	28	3.189%
	20-21 years old	401	45.672%
	22 years and over	449	51.139%
The source of college entrance examination candidates	Fujian Province	720	82.005%
	Other provinces	158	17.995%
	games master	197	22.437%
Future employment trends	Institutional coaching	323	36.788%
	Upgrade from a junior college student to a university student	188	21.412%
	start an undertaking	66	7.517%
	other	104	11.845%
The school I am currently attending	A check	44	5.011%
	B check	349	39.749%
	C check	94	10.706%
	D check	88	10.023%
	E check	303	34.510%

In the valid sample, 720 males (82.005%) and 158 females (17.995%) were included; the age distribution is mainly over 20 years old, with 401 individuals aged 20-21 (45.672%) and 449 individuals aged 22 and above (51.139%); the majority of the samples come from Fujian Province (82.005%). In terms of school distribution, the sample sizes at School B and School E are relatively large, at 349 (39.749%) and 303 (34.510%), respectively, while the sample sizes at the other three schools are relatively smaller.



This survey also collected information on students' future employment preferences. The results show that students majoring in Physical Education have diverse career intentions, with the highest number choosing to become institutional coaches (323 people, 36.788%). Following closely are those who wish to become physical education teachers (22.437%) and pursue further education (21.412%). Overall, the sample group of this survey is characterized by a high proportion of males, primarily aged over 20, mainly from Fujian Province, and diverse employment preferences, with institutional coaching being the most common direction.

Confirmatory factor analysis refers to the comprehensive analysis of collected survey data using statistical principles, aiming to test whether each factor and the corresponding observed variables are consistent with the pre-assumed hypothesis. Then, all indicators are tested to judge whether the confirmatory factor analysis model is valid.

The core competencies of physical education majors include 4 latent variables and 27 observation questions. The confirmatory factor analysis was carried out using AMOS 26.0, and the results are as follows Table 4.

Table 4 Validation factor analysis model fit index

Model fit metrics	Optimal Criterion	Statistical Value
CMIN	—	328.346
DF	—	320
CMIN/DF	<3	1.026
RMR	<0.08	0.025
GFI	>0.9	0.973
AGFI	>0.9	0.968
NFI	>0.9	0.976
IFI	>0.9	0.999
TLI	>0.9	0.999
CFI	>0.9	0.999
RMSEA	<0.08	0.005

Table 4, CMIN/DF = 1.026, RMR = 0.025, GFI = 0.973, AGFI = 0.968, NFI = 0.976, IFI = 0.999, TLI = 0.999, CFI = 0.999, RMSEA = 0.005. All fit indicators meet the standards, indicating that the partial confirmatory factor analysis model is valid and matches the survey data well. The confirmatory factor analysis model is as follows, Figure 2.

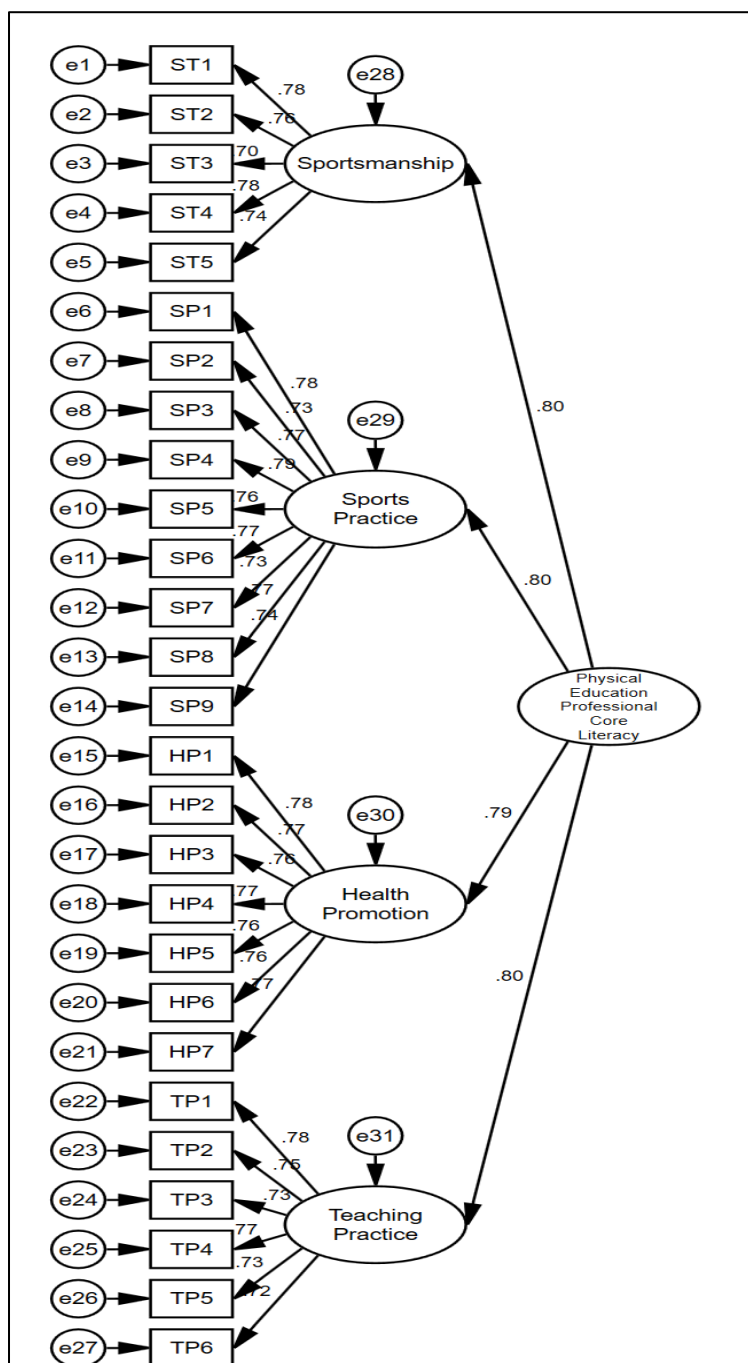


Figure 2 Confirmatory factor analysis model



Table 5 Overall, the second-order Model non-standardized regression coefficients and the significance test overview table

			Estimate	S.E.	C.R.	P	Standardization coefficient	CR	AVE
SS	<---	PSP	1				0.797		
SP	<---	PSP	0.862	0.053	16.366	***	0.804	0.876	0.639
HP	<---	PSP	1.009	0.062	16.159	***	0.794		
TP	<---	PSP	1.113	0.069	16.168	***	0.803		
SS1	<---	SS	1				0.775		
SS2	<---	SS	1.059	0.046	22.991	***	0.764		
SS3	<---	SS	0.948	0.045	20.974	***	0.704	0.868	0.569
SS4	<---	SS	1.14	0.048	23.631	***	0.783		
SS5	<---	SS	1.22	0.055	22.222	***	0.742		
SP1	<---	SP	1				0.779		
SP2	<---	SP	0.868	0.038	22.917	***	0.729		
SP3	<---	SP	1.134	0.046	24.655	***	0.774		
SP4	<---	SP	1.004	0.04	25.389	***	0.793		
SP5	<---	SP	0.865	0.036	24.072	***	0.759	0.925	0.579
SP6	<---	SP	1.15	0.047	24.43	***	0.768		
SP7	<---	SP	0.833	0.036	23.108	***	0.734		
SP8	<---	SP	1.068	0.044	24.491	***	0.77		
SP9	<---	SP	1.223	0.052	23.383	***	0.741		
HP1	<---	HP	1				0.775		
HP2	<---	HP	0.886	0.037	24.056	***	0.771		
HP3	<---	HP	0.883	0.038	23.483	***	0.755		
HP4	<---	HP	1.015	0.042	23.929	***	0.767	0.909	0.588
HP5	<---	HP	0.944	0.04	23.784	***	0.763		
HP6	<---	HP	0.993	0.042	23.703	***	0.761		
HP7	<---	HP	1.143	0.047	24.166	***	0.774		
TP1	<---	TP	1				0.776		
TP2	<---	TP	0.891	0.039	22.935	***	0.753		
TP3	<---	TP	0.764	0.034	22.294	***	0.734		
TP4	<---	TP	0.97	0.041	23.407	***	0.766	0.884	0.559
TP5	<---	TP	0.807	0.036	22.291	***	0.734		
TP6	<---	TP	0.925	0.042	21.887	***	0.723		

The convergent validity analysis of core competencies in physical education was conducted, and the results are as follows Table 6.

Table 6 Convergence validity test of core literacy of the physical education major

Variable	Item	Factor Loading	CR	AVE
Sportsmanship	SS1	0.775	0.868	0.569
	SS2	0.764		



Variable	Item	Factor Loading	CR	AVE
Sports practice	SS3	0.704	0.925	0.579
	SS4	0.783		
	SS5	0.742		
	SP1	0.779		
	SP2	0.729		
	SP3	0.774		
	SP4	0.793		
	SP5	0.759		
	SP6	0.768		
	SP7	0.734		
Health promotion	SP8	0.770	0.909	0.588
	SP9	0.741		
	HP1	0.775		
	HP2	0.771		
	HP3	0.755		
	HP4	0.767		
	HP5	0.763		
Teaching practice	HP6	0.761	0.884	0.559
	HP7	0.774		
	TP1	0.776		
	TP2	0.753		
	TP3	0.734		
	TP4	0.766		
	TP5	0.734		
	TP6	0.723		

Table 6 shows all the standardized factors of all measurement indicators of each variable in the core literacy of physical education major are more than 0.6, the composition reliability (CR) is more than 0.7, and the average variance extraction (AVE) is more than 0.5, which all meet the above standards, indicating that the convergent validity of each variable in the core literacy of physical education major is good.

In the section on Correlation analysis, Correlation analysis is a statistical method used to study the close relationships and degrees of association between variables in research. It primarily verifies whether there exists an interrelated relationship among several variable factors in the research hypothesis, as well as the degree of this relationship. In this paper, Pearson correlation coefficients are used for analysis. When the correlation coefficient r is 0, it indicates that there is no correlation between the two; when the correlation coefficient r is greater than 0, it indicates a positive correlation between the two variables; when the correlation coefficient r is less than 0, it indicates a negative correlation between the two variables. For more details on the correlation analysis in this paper, see Table 7.

Table 7 Correlation analysis table

	Sportsmanship	Sports practice	Health promotion	Teaching practice
Sportsmanship	1			
Sports practice	0.572***	1		
Health promotion	0.550***	0.597***	1	
Teaching practice	0.574***	0.570***	0.569***	1

As can be seen from the above table, all dimensions are significantly correlated at the level of 5%, which means that the variables have a high correlation.

In the section of the Group Comparison Analysis, through qualitative analysis and pre-survey, the determined index architecture structure model was used to conduct differential analysis, and the independent t-test or analysis of variance was used to test the differences between the groups about demographic factors. This paper examines gender differences, education level, provinces, and employment tendency in core literacy cognition. In this part, there is only formal research content.

Discussion

This study successfully constructed and validated a multidimensional model of core literacy among physical education (PE) students in higher vocational colleges in Fujian Province. The model comprises four interrelated dimensions: sportsmanship, sports practice, health promotion, and teaching practice, each reflecting a critical competency aligned with modern expectations of PE professionals.

The Confirmatory Factor Analysis (CFA) demonstrated that the proposed model has strong structural validity and internal consistency. These findings support the theoretical assumption that core literacy in PE is not limited to physical skills but encompasses a broader range of attributes essential for holistic professional development. The result aligns with Yu Sumei's (2017) research, which emphasized the integration of sports science and education as foundational to cultivating comprehensive student competencies.

Among the four dimensions, sportsmanship received the highest weight (0.4049), reflecting the strong emphasis on ethics, discipline, and cooperation in Chinese physical education culture. This outcome reinforces prior findings that values-based education remains central to the development of competent PE teachers (Gu, 2021). Likewise, health promotion and sports practice also showed solid scores, indicating students' growing awareness of fitness and their participation in sports activities.

However, the relatively lower score in teaching practice (0.1902) highlights a critical gap in the training of vocational PE students. This suggests that while students may possess personal competence and health awareness, they often lack opportunities to engage in structured teaching experiences. This weakness underscores the urgent need for reform in field-based practicums, pedagogical simulations, and mentorship opportunities within vocational programs.

In comparison with prior frameworks, this study's model provides a more context-specific approach tailored to the needs of vocational students in China. While previous models focused primarily on general teacher education, the current study emphasizes competencies relevant to both school-based teaching and lifelong physical activity promotion, filling a key gap in vocational education research.

Moreover, by combining expert input, Delphi refinement, and statistical modeling (CFA and AHP), the study offers a reliable tool for evaluating and improving PE curricula. The model can be adapted by educational institutions to monitor student growth, revise teaching strategies, and establish competency-based benchmarks for PE majors.

In summary, the validated model serves not only as an academic contribution but also as a practical framework for enhancing the professional quality of PE students in vocational colleges. Future research



should expand this work by conducting longitudinal studies and applying the model in diverse regions to enhance generalizability and policy relevance.

Conclusion

This study examined the core literacy of physical education (PE) students in higher vocational colleges in Fujian Province, aiming to define its conceptual dimensions, assess current performance levels, and construct a validated evaluation model. The findings offer several key conclusions:

1. Core Literacy as a Professional Foundation: Core literacy in physical education encompasses more than technical skills; it integrates ethical orientation, health consciousness, practical competence, and pedagogical readiness. These elements collectively prepare students for their future roles as PE teachers and health promoters.

2. Four-Dimensional Model Structure: The research confirmed a four-dimensional model of core literacy comprising sportsmanship, sports practice, health promotion, and teaching practice. A total of 21 key indicators were identified and validated using Confirmatory Factor Analysis (CFA), with sportsmanship receiving the highest path coefficient (0.4049), followed by health promotion (0.2225), teaching practice (0.1902), and sports practice (0.1824).

3. Educational Implications: The relatively low score in teaching practice highlights the need for enhanced pedagogical training within vocational PE curricula. Strengthening student-teacher internships, teaching simulations, and field-based learning opportunities is critical for developing effective PE professionals.

4. Strategic Alignment with Policy and Reform: The validated model aligns with recent Chinese educational reforms aimed at improving teacher competency and fostering health-oriented education. It offers a practical tool for institutions to assess student progress, revise curriculum content, and set measurable targets for graduate outcomes.

In conclusion, this study contributes both a theoretical model and a practical framework for improving physical education teacher training in vocational settings. It also establishes a foundation for future longitudinal and comparative research on core literacy in other regions and educational levels.

Recommendation

Based on the findings and analysis of this study, the following recommendations are proposed to enhance the development of core literacy among physical education (PE) students in higher vocational colleges:

1. Adopt Differentiated Instruction Based on Student Profiles

Instructors should recognize and accommodate individual differences in students' abilities, motivations, and learning needs. Teaching strategies should be adapted to support diverse learners, promoting both personalized development and collaborative learning environments.

2. Promote Integrated Learning Through Multi-Channel Approaches

Institutions should encourage a dual-track learning system that combines classroom instruction with extracurricular and real-world experiences. This includes expanding opportunities for sports participation, community health promotion, internships, and service learning, enhancing both theoretical knowledge and practical application.

3. Strengthen Teaching Management Through Rigorous Assessment

A systematic evaluation framework should be established to monitor the effectiveness of teaching practices and curriculum implementation. Regular supervision, formative assessment, and feedback mechanisms are essential to ensuring that core literacy objectives are achieved and continuously improved.



4. Embed Teaching Practice Early and Continuously in the Curriculum

Given the relatively weak performance in the teaching practice dimension, vocational colleges should embed pedagogical training—such as micro-teaching, peer observation, and classroom simulations—throughout the study period rather than limiting it to the final year.

5. Use the Evaluation Model as a Strategic Tool

The validated core literacy model from this study can serve as a diagnostic and planning tool for educators, administrators, and policymakers. It enables data-driven decisions regarding curriculum reform, faculty development, and student support services.

References

- Campbell, R. J., Kyriakides, L., Muijs, R. D., & Robinson, W. (2003). Differential teacher effectiveness: Towards a model for research and teacher appraisal. *Oxford Review of Education*, 29(3), 347–362. <https://doi.org/10.1080/03054980307440>
- Cao, Y. (2021). Knowledge and belief: A study on teacher core literacy based on student performance. *Journal of Mathematics Education*, 30(4), 1–5.
- Gu, X. (2021). A causal pathway of physical activity to motor competence in childhood: Evidence from a school-based intervention. *Journal of Sports Sciences*, 39(4), 460–468. <https://doi.org/10.1080/02640414.2020.1825801>
- Jackson, K., & Bazeley, P. (2019). *Qualitative data analysis with NVivo* (3rd ed.). SAGE Publications.
- Jiang, Y., Ma, J., & Zhao, H. (2019). Implications and cultivation path of core literacy in physical education and health subjects based on embodied cognition. *Sports Journal*, 26(4), 88–93.
- Li, G., & Lv, L. (2017). Campus practice of curriculum transformation: An analytical framework for core literacy implementation. *Modern Education Management*, (9), 64–69.
- Lipei, S., Xiang, L., & Yuan, T. (2018). The turn of the physical education classroom and teaching transformation based on the development of students' core literacy. *Journal of Physical Education*, 25(2), 68–75.
- UNESCO. (2006). *Learn to survive and educate the world of today and tomorrow*. Education Science Press.
- Wang, G., Zhang, Z., & Chen, S. (2019). Two-helix structure model of teacher core literacy and competence. *Curriculum, Teaching Material and Canon Law*, 39(9), 132–138.
- Yu, S. (2017). The research on the construction of students' core literacy in physical education under the background of curriculum reform. *Journal of Physical Education*, 24(6), 102–107.
- Yu, Z., Zeng, H., Zhao, Y., Zhang, X., Wang, Z., Tao, Y., Yuan, M., & Sun, X. (2024). Bibliometric analysis of physical education research in China from 2014 to 2024. In *Proceedings of the 2024 7th International Conference on Educational Technology Management (ICETM 2024)* (pp. 128–132). ACM.

