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SWOT-AHP Analysis and Development Path of Interdisciplinary Integration of Physical Education

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Abstract: This paper focuses on the SWOT-AHP model. Through systematic analysis, this study sorts out the core difficulties faced by physical education, which is embodied in the subject barrier of curriculum design, the structural shortage of teacher resources and the utilitarian bias of social cognition. This paper makes an in-depth analysis from the four dimensions of advantages, disadvantages, opportunities and threats, and points out that interdisciplinary integration can improve students; comprehensive quality, promote the cooperation between teachers and students, and broaden their learning horizon, but it also faces challenges such as lack of teacher resources, lack of cases and lagging evaluation mechanism. Through the analytic hierarchy process (AHP) analysis method, the paper determines the weight of each factor, and puts forward the development paths such as optimizing the curriculum design, strengthening teacher training and improving the evaluation mechanism, so as to promote the deep integration of physical education and other disciplines and improve the quality of education.

1. Introduction

In the context of the new round of educational reform, interdisciplinary integration is regarded by the international education community as a key strategy to achieve the improvement of education quality[1]. As the core carrier to promote students' physical and mental health, the interdisciplinary integration of physical education can not only bridge the gap of knowledge between disciplines, but also cultivate students' comprehensive literacy through the integration of multiple knowledge. However, in the process of interdisciplinary integration, physical education still faces problems such as single curriculum design, insufficient teacher resources and backward evaluation mechanism, which seriously restricts its development. Therefore, based on SWOT analysis and hierarchical analysis (AHP), this paper deeply discusses the advantages, disadvantages, opportunities and challenges of the interdisciplinary integration of physical education, and puts forward the corresponding development path, in order to provide theoretical support and practical

guidance for the innovation and practice of physical education.

2. The current dilemma facing physical education

2.1. Lack of comprehensive curriculum design

At present, there is a lack of effective interdisciplinary integration between physical education and other disciplines, the curriculum design is single, and it is difficult to connect with students' life experience and other subject knowledge [2]. When students participate in sports activities, they generally lack the systematic cognition between sports behavior and the improvement of physical quality, mental health maintenance and teamwork ability cultivation, which leads to the difficulty to internalize the multi-dimensional value of physical education.

2.2. Teachers' professional quality and teaching resources are insufficient

Many schools pay insufficient attention to the recruitment and training of teachers, which leads to the uneven professional quality and teaching ability of physical education teachers. Some teachers lack modern educational concepts and systematic training of interdisciplinary teaching, and it is difficult to carry out innovative teaching activities. In addition, the insufficient investment in sports facilities, equipment and teaching resources limits the diversity and effectiveness of teaching activities, and restricts the implementation of physical education.

2.3. Lack of social cognition of the value of physical education

In many family and social settings, physical education is often seen as an auxiliary curriculum; whose importance is overlooked [3]. This concept not only affects the importance of students to physical education courses, but also reduces their enthusiasm for participation. The bias of schools against physical education in the process of enrollment, evaluation and college admission further aggravates this phenomenon, which makes physical education marginalized in the overall education system, and it is difficult to obtain due attention and support.

These difficulties are intertwined, which seriously restrict the development of physical education, and it is urgent to seek effective breakthroughs and improvement through interdisciplinary integration and innovative strategies.

3. Qualitative analysis of the interdisciplinary integration development of physical education based on SWOT

3.1. Strengths Analysis

3.1.1. Enhance the comprehensive quality of students

The interdisciplinary integration of physical education can significantly improve the comprehensive quality of students by integrating physical activity with the knowledge of other disciplines. When participating in physical education courses, students not only exercise their physical fitness, but also learn important skills such as teamwork, leadership and emotional management. Taking team movement as an example, based on the theory of social constructivism, students should realize the coordinated development of individual ability and collective goals through dynamic role allocation and task negotiation, so as to promote the generation of high-order thinking ability. The interdisciplinary curriculum design enables students to combine physical activities with scientific principles, mathematical computing and humanities, prompting them to

understand theory in practical application, develop a comprehensive way of thinking and problem-solving ability. The promotion of this comprehensive quality has laid a solid foundation for students&; academic development and social life.

3.1.2. Promote the communication and cooperation between teachers and students

Interdisciplinary integration not only provides students with diverse learning experiences, but also promotes communication and collaboration between teachers and students. When physical education teachers and other subjects teachers design and implement courses together, they can have in-depth communication on course content, teaching methods and evaluation standards, and form a systematic teaching ideas and strategies [4]. This collaboration enriches the course content and provides students with a three-dimensional knowledge system through the perspective of different disciplines. In this process, teachers can learn from each other, share professional knowledge and teaching experience, and improve their educational literacy. In addition, the atmosphere of teamwork sets a good example for students, cultivates their sense of teamwork and cooperation, and improves the quality of education.

3.1.3. Broaden the students' learning horizon

The interdisciplinary physical education model has significantly broadened students' learning horizons by integrating sports with art, science and technology, humanities and other fields. Students not only passively accept the knowledge, but also actively build a knowledge system in the exploration and practice. For example, in the course of combining physical education and science, students understand biomechanical principles through practical exercise experience, and the combination of theory and practice stimulates their interest in learning. The interdisciplinary integrated teaching mode makes the learning content more interesting and challenging, attracts students to participate actively, improves the learning motivation, and cultivates the ability and habit of lifelong learning.

3.2. Weaknesses Analysis

3.2.1. Lack of teacher resources and training

In the current education system, the successful implementation of curriculum integration depends on teachers with professional knowledge and practical ability. However, the lack of teacher resources and imperfect training mechanisms have become important obstacles to interdisciplinary curriculum integration. Many schools fail to meet the needs of interdisciplinary teaching in the teacher allocation, which makes it difficult for some teachers to effectively integrate the knowledge of various disciplines. The existing training system focuses on the teaching method of a single subject and lacks systematic training for interdisciplinary teaching, which affects the innovation of curriculum design and the deep understanding of students, and has a negative impact on the quality of education.

3.2.2. Lack of effective cases in interdisciplinary teaching

As a novel educational model, interdisciplinary teaching still lacks a mature theoretical system and successful cases, which leads to the confusion for educators in practice. Although some schools try to integrate different subject content, these attempts often become mere formality and fail to produce the desired effect due to the lack of systematic guidance and clear teaching framework. In addition, the educational circle has insufficient research on interdisciplinary teaching, the existing

literature focuses on theoretical discussion, and lacks in-depth analysis of practical operation experience, which restricts the maturity and promotion of interdisciplinary teaching mode.

3.2.3. School management and evaluation mechanism is difficult to adapt to the new requirements

With the promotion of interdisciplinary teaching, the traditional school management and evaluation mechanisms face challenges. Many schools still follow the single discipline and fail to meet the new requirements of interdisciplinary integration. This management and evaluation mode cannot fully reflect the performance of students in interdisciplinary learning, and the evaluation of teachers&; teaching effect is also one-sided, and it is difficult to encourage teachers to participate in teaching innovation. In addition, schools lack flexibility in curriculum setting, resource allocation and teaching evaluation, which limits the promotion and development of interdisciplinary teaching.

3.3. Opportunities Analysis

3.3.1. Support of the educational policy

In recent years, national and local education departments have issued a series of policies to encourage interdisciplinary integration. China Education Modernization 2035 clearly proposes "promoting interdisciplinary integration" (State Council, 2019), providing theoretical basis and practical support for education reform. The policy clearly proposes to promote educational innovation, optimize the curriculum setting, and promote the inter-subject exchange and cooperation, which provides a clear path for the teaching practice of schools and teachers. Especially in the formulation of the new curriculum standards, the introduction of interdisciplinary education concepts enables educators to integrate the knowledge of various disciplines more targeted, and create rich and diversified learning experiences for students. The support of education policy provides a legal and policy framework for interdisciplinary integration, and promotes teaching innovation and improves education quality.

3.3.2. The social demand for comprehensive quality-oriented education continues to grow

With the progress of social economy and science and technology, people's expectation for education has shifted from a single knowledge transmission to a comprehensive quality cultivation, which provides an opportunity for interdisciplinary integration. Parents and the public pay more and more attention to the comprehensive quality of students, and expect them to fully develop in emotion, social communication, critical thinking and innovation ability. Schools are facing the pressure of transformation and urgently need an educational model that meets the needs of the society. Through the organic combination of physical education, art, science and other disciplines, interdisciplinary education cultivates students' abilities in various aspects, responds to the social call for all-round quality education, and promotes the renewal of school education concepts and the promotion of interdisciplinary integration.

3.3.3. The development of information technology

The rapid development of information technology has brought about changes to the field of education, especially in the field of curriculum integration and teaching innovation. Through big data analysis, online learning platform, virtual reality and other technologies, teachers can better integrate the knowledge of various subjects, design more vivid and interactive teaching activities, and improve students' interest and participation in learning. For example, with the help of virtual

reality technology, students can learn physical activities in a simulated environment, while understanding relevant scientific principles to promote a deep understanding of knowledge. Information technology also enables teachers to monitor students' learning progress in real time, carry out personalized teaching adjustments, improve teaching efficiency, and provide new possibilities for curriculum innovation and integration.

3.4. Threats Analysis

3.4.1. External competition pressure is increasing

Under the background of globalization and informatization, the increasingly fierce competition among educational institutions, especially the rise of private educational institutions and international schools, makes the traditional public schools face challenges [5]. In order to cope with external competition, many schools have to re-examine resource allocation and educational concepts, which may lead to a decline in attention to interdisciplinary integrated education. In the case of limited resources, schools tend to improve their short-term academic performance and ignore comprehensive quality education, which weakens the implementation foundation of interdisciplinary education and limits the space for teaching innovation. External competition pressure may affect the rational allocation of educational resources and hinder the advancement of interdisciplinary integration.

3.4.2. The traditional teaching model is deeply rooted

Although the interdisciplinary integration education has significant advantages, it often faces strong resistance from the traditional teaching mode in the process of its promotion [6]. Many educators and managers still cling to the traditional concept of knowledge teaching and emphasize the clarity of disciplinary boundaries, leading them to be cautious about interdisciplinary teaching. In addition, due to the lack of interdisciplinary teaching experience and systematic training, some teachers resist the new model and worry that they cannot achieve the expected teaching effect. This conservative attitude not only hinders the renewal of teaching methods, but also delays the process of educational innovation. At the same time, the traditional evaluation system relies on standardized examinations and subject scores, which makes it difficult for schools to formulate appropriate evaluation standards when implementing interdisciplinary integration, which affects the recognition and acceptance of the new teaching mode by teachers and students. Therefore, the deep-rooted traditional teaching mode not only suppresses the promotion of the new mode, but also brings greater challenges to the education reform.

4. Quantitative analysis of the interdisciplinary integration development of physical education based on hierarchical analysis

Analytic hierarchy process (AHP) analysis is a systematic and hierarchical multi-criterion decision analysis method, proposed as [7] by American operations radiologist Thomas L. Saaty in the 1970s. AHP decomposes complex problems into multiple levels (such as target layer, criterion layer and scheme layer), and determines the relative importance of each level by comparison, and finally obtains the weight of each factor through mathematical calculation, so as to provide scientific basis for decision-making.

4.1. Establishment of the hierarchical structure model

Based on the SWOT-AHP analysis framework, this study constructed a three-level hierarchical

model (see Figure 1) including the target layer (interdisciplinary integration development of physical education), criterion layer (S-W-O-T) and index layer (11 sub-factors), and ensured the theoretical validity of the model through expert review.

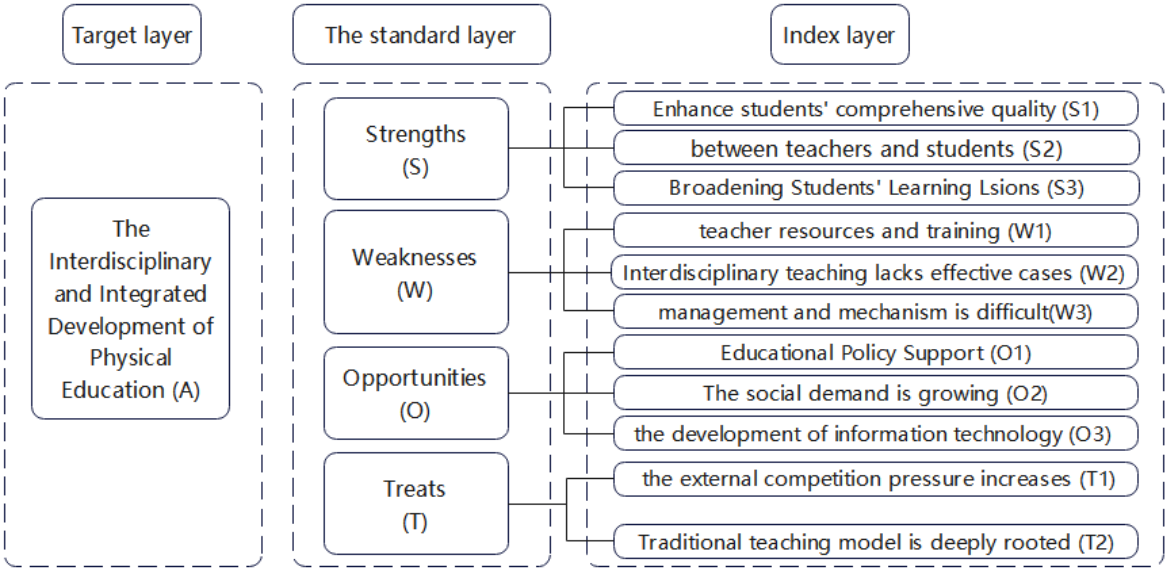

Figure 1: The SWOT analyzes the hierarchical structure model.

4.2. Construct criterion layer judgment matrix and calculate index weight

As can be seen from Figure 1, the criteria level in the index system of interdisciplinary integrated development of physical education includes four indicators: advantages, disadvantages, opportunities and threats. The four indicators on the criteria level are compared in pairs to obtain a fourth-order judgment matrix. In this paper, the commonly used 1-9 scale, which is the increasing relationship between the former and the importance of the latter. If the latter is more important than the former, the reciprocal scale of 1-9 is used, and the basis for judging the matrix comparison is the content of the next level index included in each index of the criterion level. When the eigenvector and eigenvalue are obtained for the resulting fourth-order matrix, it is necessary to judge whether the consistency test has passed. If the fourth-order matrix passes the consistency test, each component of the eigenvector can be taken out as the basis for the proportion between the first-level grade evaluation indicators. The judgment matrix and the index weight of the criterion layer are shown in Table 1.

Table 1: Comparative judgment matrix of the interdisciplinary integrated development of physical education.

Target	S	W	O	T	Weight	Icr
S	1	5	2	3	0.4693	CR=0.0658<0.1
W	1/5	1	1/3	2	0.1238	
O	1/2	3	1	4	0.3178	
T	1/3	1/2	1/4	1	0.0891	

4.3. Construct the index layer judgment matrix and calculate the index weight

4.3.1. Construct a judgment matrix of the strengths

Through the decomposition of the index system of interdisciplinary integrated development of physical education, the criterion index of superiority includes three indicators, which are to enhance

students &;comprehensive quality (S1), promote the communication between teachers and students (S2), and broaden students; learning horizon (S3). The judgment matrix of these three indexes is constructed through the expert evaluation method, and the hierarchical analysis method is used to calculate the weight of the scheme layer, as shown in Table 2.

Table 2: Comparative judgment matrix of the interdisciplinary integrated development of physical education.

Target	S1	S2	S3	Weight	Icr
S1	1	2	4	0.5741	CR=0.0208<0.1
S2	1/2	1	2	0.2857	
S3	1/4	1/2	1	0.1429	

4.3.2. Construct a judgment matrix of the weaknesses

Through the decomposition of the index system of interdisciplinary integrated development of physical education, there are three indicators of the corresponding indicators, namely, the lack of teacher resources and training (W1), the lack of effective cases of interdisciplinary teaching (W2), and the difficulty of school management and evaluation mechanism to meet the new requirements (W3). The judgment matrix of these three indexes is constructed through the expert evaluation method, and the hierarchical analysis method is used to calculate the weight of the scheme layer indexes, as shown in Table 3.

Table 3: Comparative judgment matrix of interdisciplinary integrated development weakness of physical education

Target	W1	W2	W3	Weight	Icr
W1	1	3	5	0.6267	CR=0.0825<0.1
W2	1/3	1	3	0.2797	
W3	1/5	1/3	1	0.0936	

4.3.3. Construct a judgment matrix of the opportunities

Through the decomposition of the index system of interdisciplinary integrated development of physical education, there are three indicators of the corresponding indicators, namely, the support of education policy (O1), the continuous growth of social demand for comprehensive quality education (O2), and the development of information technology (O3). The judgment matrix of these three indexes is constructed through the expert evaluation method, and the hierarchical analysis method is used to calculate the weight of the scheme layer indexes, as shown in Table 4.

Table 4: Comparative judgment matrix of interdisciplinary integrated development opportunities of physical education

Target	O1	O2	O3	Weight	Icr
O1	1	3	7	0.6687	CR=0.0681<0.1
O2	1/3	1	3	0.2431	
O3	1/7	1/3	1	0.0882	

4.3.4. Construct a judgment matrix of the treats

Through the decomposition of the index system of interdisciplinary integrated development of physical education, there are two indicators of the threat layer and its corresponding layer, which respectively increase the external competition pressure (T1) and the traditional teaching mode is

deeply rooted (T2). The judgment matrix of these three indexes is constructed through the expert evaluation method, and the hierarchical analysis method is used to calculate the weight of the scheme layer, as shown in Table 5.

Table 5: Comparative judgment matrix of interdisciplinary integrated development treats of physical education

Target	T1	T2	Weight	Icr
T1	1	2	0.6667	CR=0.0042<1
T2	1/2	1	0.3333	

By calculating the weight of each index, the weight of the interdisciplinary integrated development index of physical education is shown in Table 6.

Table 6: Judgment matrix of interdisciplinary integration development of physical education

Target layer	The standard layer	Weight	Index layer	Weight	Comprehensive weight
Interdisciplinary and integrated development of physical education	Strengths (S)	0.4693	S1	0.5741	0.2694
			S2	0.2857	0.1341
			S3	0.1429	0.067
	Weaknesses(W)	0.1238	W1	0.6267	0.0776
			W2	0.2797	0.0346
			W3	0.0936	0.0116
	Opportunities(O)	0.3178	O1	0.6687	0.2125
			O2	0.2431	0.0773
			O3	0.0882	0.028
	Treats(T)	0.0891	T1	0.6667	0.0594
			T2	0.3333	0.0297

5. Analysis on the development path of physical education

5.1. Optimize the course design and promote the deep integration between disciplines

The primary task of the interdisciplinary integration of physical education is to optimize the curriculum design and break the barriers between traditional disciplines. The school can learn from the Finnish "phenomenon teaching" model, and take the thematic project as the link to reconstruct the curriculum connection of sports and science (such as sports biomechanics), art (such as choreography), humanities (such as sports history), so as to form the integration path [8] of "knowledge-skill-emotion". Through this interdisciplinary curriculum design, students can not only improve their physical quality, but also cultivate their comprehensive quality in a diversified learning environment.

5.2. Strengthen teacher training and enhance the interdisciplinary teaching ability

Teachers are the key implementers of interdisciplinary integration education, so it is very important to improve teachers' interdisciplinary teaching ability [9]. Schools should strengthen the training of physical education teachers, especially the training of interdisciplinary teaching methods, to help teachers master how to organically integrate the knowledge of different disciplines into physical education teaching. In addition, schools should also encourage physical education teachers to cooperate with teachers of other disciplines to jointly design interdisciplinary courses, share teaching experience, form teaching teams, and improve the overall teaching level.

5.3. Improve the evaluation mechanism to meet the needs of interdisciplinary teaching

The traditional evaluation mechanism is often based on a single subject, and it is difficult to fully reflect the performance of students in interdisciplinary learning. Therefore, schools should establish an evaluation system adapted to interdisciplinary teaching, and comprehensively consider students&; performance in physical education, science, art and other aspects. The evaluation criteria should be more flexible and focus on improving students; overall quality, rather than just focusing on test scores. Through this diversified evaluation mechanism, schools can better motivate students to participate in interdisciplinary learning, and also provide more comprehensive teaching feedback for teachers.

5.4. Use information technology to promote teaching innovation

The rapid development of information technology has provided new possibilities for interdisciplinary teaching. Schools should make full use of big data, virtual reality, online learning platform and other technical means to design a more vivid and interactive interdisciplinary teaching activities [10]. For example, through virtual reality technology, students can learn from physical activities in a simulated environment, while understanding the relevant scientific principles and promoting a deep understanding of knowledge. In addition, information technology can also help teachers to monitor students' learning progress in real time, make personalized teaching adjustment, and improve the teaching effect.

6. Conclusions

Interdisciplinary integration of physical education is an important way to improve students&; comprehensive quality and promote educational innovation. By optimizing the curriculum design, strengthening teacher training, improving the evaluation mechanism, using information technology, strengthening policy support and responding to challenges, the school can effectively promote the deep integration of physical education with other disciplines, improve the quality of education, and cultivate students with more comprehensive quality.

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